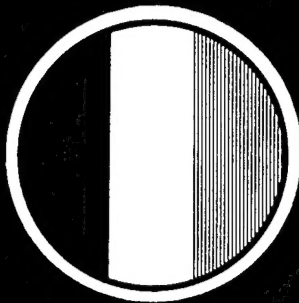


UNCLASSIFIED

UNITED STATES ARMY TRAINING AND DOCTRINE COMMAND

TRADOC 5 BULLETIN 5



- WEAPONS
- TACTICS
- TRAINING

TRAINING

WITH

LAW

30 JUNE 1976

UNCLASSIFIED

20010803 048

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
<small>Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.</small>				
1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE 30 JUNE 1976		3. REPORT TYPE AND DATES COVERED FINAL
4. TITLE AND SUBTITLE TRADOC BULLETIN 5. TRAINING WITH LAW				5. FUNDING NUMBERS
6. AUTHOR(S)				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) HQ U.S. ARMY TRAINING AND DOCTRINE COMMAND ATTN: ATCG-T FORT MONROE VIRGINIA 23651				8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSORING / MONITORING AGENCY REPORT NUMBER
11. SUPPLEMENTARY NOTES See TRADOC Bulletin 4 dated January 1976				
12a. DISTRIBUTION / AVAILABILITY STATEMENT APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.				12b. DISTRIBUTION CODE
13. ABSTRACT (Maximum 200 words) This bulletin is about LAW, the light antitank weapon of our family of infantry antitank weapons. LAW, Dragon, and TOW make up that family and are all vital weapons on the modern mechanized battlefield. Our success in the first battle of the the next war will depend, in large measure, on our ability to use them at the highest level of combat effectiveness.				
14. SUBJECT TERMS				15. NUMBER OF PAGES 48
				16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT UNCLASSIFIED	18. SECURITY CLASSIFICATION OF THIS PAGE UNCLASSIFIED	19. SECURITY CLASSIFICATION OF ABSTRACT UNCLASSIFIED	20. LIMITATION OF ABSTRACT UNLIMITED	

THIS IS AN ARTEP* SUPPORTING DOCUMENT

***ARMY TRAINING AND EVALUATION PROGRAM**

**UNITED STATES ARMY
TRAINING AND DOCTRINE COMMAND
BULLETIN NO. 5**

TRAINING WITH LAW

TABLE OF CONTENTS

I	Introduction	2
II	Analyzing Weapon Effectiveness	4
III	The LAW Potential	6
IV	Analyzing Gunner Proficiency	12
V	Analyzing LAW Tactics	25
VI	New Doctrine	31
APPENDIX		
A	Aids For Trainers	32
B	Establishing Standards and Evaluating Performance	35
C	Ordering Bulletins	37

This TRADOC BULLETIN is intended to provide to commanders, and others concerned with military training, timely information on weapons, tactics, and training. It is not intended to supplant doctrinal publications, but to supplement material on "how to fight" with data derived from tests, recent intelligence, or other sources.

TRAINERS' NOTE: The format of this bulletin is designed to help trainers identify and extract needed information. TASOs have master copies of the diagrams and pictures in this bulletin, from which you can order slides for use in unit schools or other training.

Comment or criticism is welcome, and should be directed to:

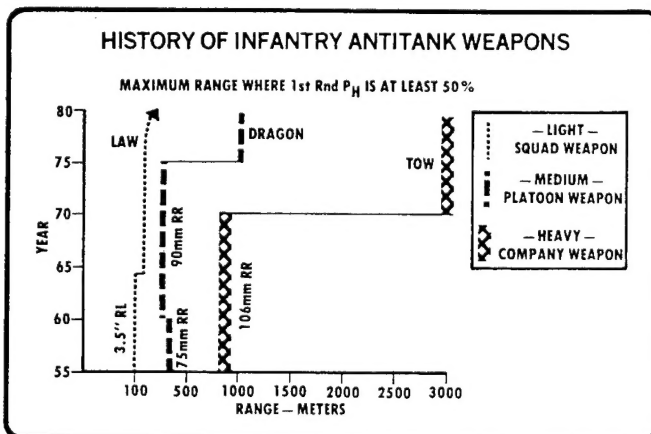
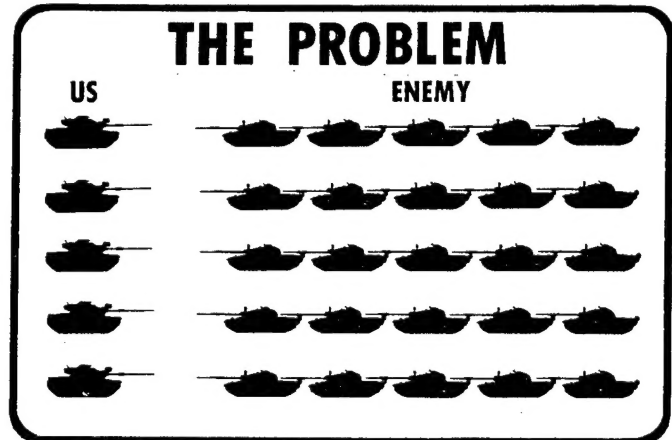
**COMMANDER
US ARMY TRAINING AND DOCTRINE COMMAND
ATTN: ATCG-T (TEL: AUTOVON 680-2445/3153)
FORT MONROE, VIRGINIA 23651**

I INTRODUCTION

This Bulletin is about LAW, the light antitank weapon of our family of infantry antitank weapons. LAW, Dragon, and TOW make up that family and are all vital weapons on the modern mechanized battlefield. Our success in the first battle of the next war will depend, in large measure, on our ability to use them at the highest level of combat effectiveness.

In the next war we can expect to face an enemy whose doctrine is built around tanks employed in large numbers, concentrated to overwhelm our defense, and supported with massive artillery fires. Potential threat armies field masses of quality armored fighting vehicles. Tank strength is also the foundation of US and NATO defense; the armies of the Federal Republic of Germany, the United States, Great Britain, and their Allies maintain strong tank forces in Central Europe. But it's been apparent since at least the early fifties, that the West's tank productive capacity is not likely to bring NATO to an overall parity with the potential threat in numbers of tanks. Moreover, modern tanks are spread among client states, world-wide, in great numbers.

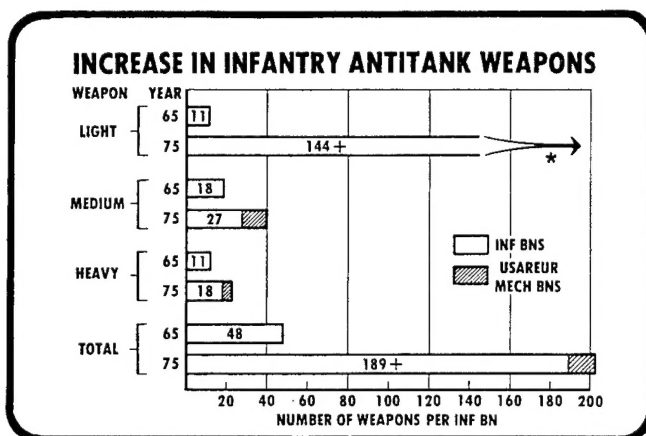
The problem: On the first battlefield of the next war enemy tanks could outnumber ours by something like 4 or 5 to 1.



The US has therefore emphasized the development of a family of infantry antitank weapons of varying portability and range.

In 1975, with the introduction of Dragon and TOW in quantity, the US Army adopted a new antitank strategy designed to saturate the battlefield with antitank weapons. The number of systems in our infantry battalions has more than tripled in the last 10 years.

Because LAW is a round of ammunition, not an assigned weapon, its introduction in 1964 provided the potential for every soldier to be a tank killer.



*The minimum number prescribed by unit Basic Load allowances. Our current light weapon, the LAW, is classed as a round of ammunition and can, like grenades, be carried by every soldier—significantly raising the actual numbers of LAW on the battlefield.

Our antitank weapons are good, probably the best in the world. But they are only as good as the soldiers who man them, and the leaders who employ them tactically. Maximizing the effect of our weapons in battle depends on our training before the battle starts and the doctrine we follow for their employment in combat.

This Bulletin presents information about training with LAW. The information comes from a series of training effectiveness studies and tests conducted by the United States Army Infantry School, the United States Army Infantry Board, and by the Combat Arms Training Board. Training with Dragon and TOW will be covered in a future Bulletin.

Overall, the studies indicated that our soldiers are *not* achieving the maximum capability engineered into the LAW. But it was equally clear that *every problem identified in the studies can be corrected by better training and improved techniques of employment.*

Before going into the results of the training studies, we need to discuss briefly what we mean by battlefield effectiveness and explain the interplay of weapons and man that determines that effectiveness.

II ANALYZING WEAPON EFFECTIVENESS

THE ANALYSIS MODEL — $E = f(W, P, T)$

Every weapon system has a built-in level of potential battlefield effectiveness, usually described by its range, lethality, speed, or some other measure of performance. But every system, whatever its potential, depends finally on the skill of the people who employ it. Training brings together the man and the machine and determines what the real effect of the weapon in combat will be. Training analysis examines this man/machine interaction to determine overall battlefield effectiveness and to find ways to improve that effectiveness. We can describe the analysis process by setting up a model, or a shorthand method for looking at each part of the whole weapon system.

E = Potential Battlefield Effectiveness

It is a function of:

W = Weapons Design Capability

P = Proficiency of the Soldier or Crew Manning the Weapon

T = Tactics or Techniques of the Leader Employing the Weapon

The **W** in the model describes weapon design characteristics and capabilities through analysis or controlled tests of the system. Hit and kill information, usually in the form of performance curves prepared by the US Army Materiel System Analysis Activity (AMSAA) or another reliable source is used to portray this built-in capability.

Individual proficiency—The **P** in the model— can be quantified by testing, analysis of range scores, or comparison with other historical data which measure soldier input to weapons effectiveness. The **T** indicates the influence that commanders or leaders have on weapons effectiveness by their tactical employment of the weapon system.

Comparing the firing results of institutional or unit training to the AMSAA curves provides a measure of training and tactical effectiveness. Results which fall below the AMSAA curves indicate problems in either training or tactics, or both. They imply inadequate battlefield preparedness.

Stated simply, we measure soldiers' ability to obtain the battlefield capability built into their weapons; then determine when, where and how to use training time and resources efficiently to improve their performance so that soldiers will use those weapons at maximum capability. The analysis system can be an equally useful tool for unit leaders and trainers to improve training effectiveness in their units.

DOCTRINE DRIVES TRAINING

Doctrine is what the majority of the Army believes is right and is prepared to act on.

Training with any weapon is conditioned, in large measure, by what officers and NCOs responsible for training believe about the weapon—how much time is needed to develop proficiency with it, its employment in combat, and the safety restrictions associated with it. In the case of the LAW, we found out that what we had or had not been teaching in our schools and saying in our literature produced some erroneous thinking in a key group of trainers.

LAW MYTHS

A number of company grade officers in a combat arms Advance Course were asked to list what they believed about the LAW. These four points summarize their response:

- LAW is an individual weapon—in the infantry squad, 2 men each carry one round
- Backblast is dangerous—cannot fire LAW from buildings or bunkers
- LAW is effective out to 400 meters
- LAW is simple to operate—requires little or no training

This is a description of what most of the Army believes about the LAW — *but it is all wrong. The proper basis for better doctrine must now be conveyed to the Army.*

III THE LAW POTENTIAL

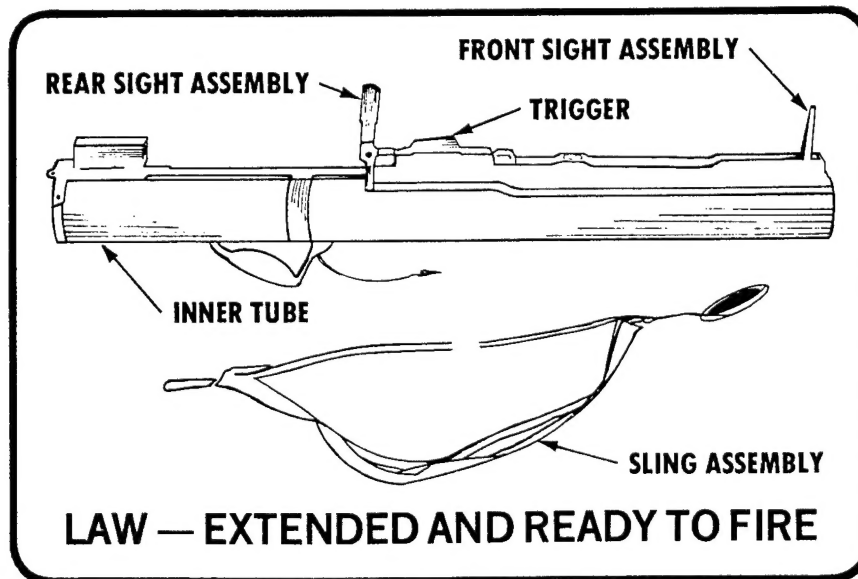
WHAT THE LAW IS DESIGNED TO DO

The LAW is the lightest and least complicated of our infantry antitank weapons and provides unique contributions to our tank killing strategy:

- Most numerous direct fire antitank weapon on the battlefield.
- Makes every soldier on the battlefield a potential tank killer.
- Only infantry weapon that can engage tanks at less than 65 meters—important in city fighting, ambushes, fog, night and other limited visibility situations.
- Only antitank weapon available to soldiers of senior headquarters and many support units—all prime objectives for enemy armor.

Some important design characteristics

Weight	5.2 lbs	Arming Range	9 meters
Length		Warhead	HEAT (Shaped Charge)
Closed	26 in.	Penetration into Rolled	
Extended	35 in.	Homogenous Armor	
Maximum Range	1000 meters	at 0°. Obliquity	12 inches



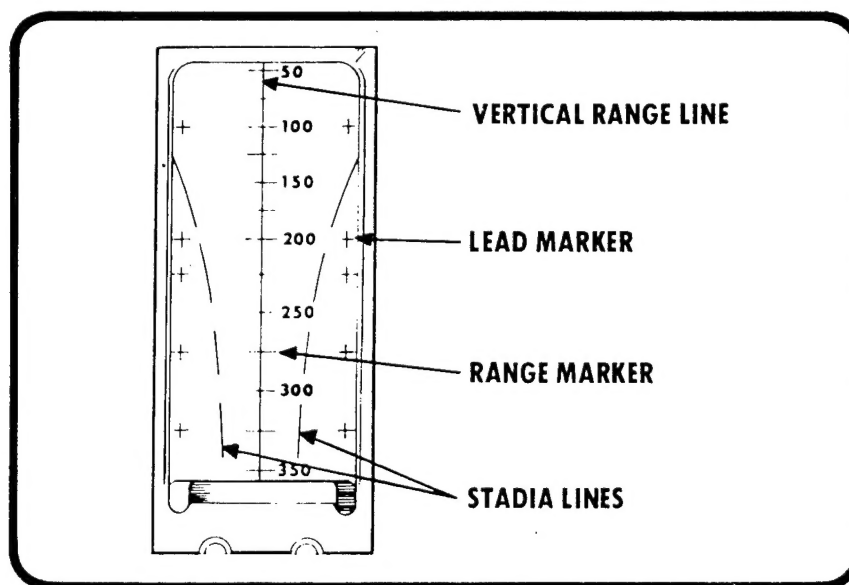
SIGHT

Range — 350 meters, in 25 meter increments

Lead Markers = 6 mph apparent speed

Stadia width designed for a target 3 meters wide x 6 meters long

WARSAW PACT TANK is 3.4 meters wide x 6.3 meters long.



DENSITY

The M72A2 LAW is a round of ammunition—the warhead is preloaded in a throwaway launcher. Although Basic Load Tables show 144 rounds authorized for an infantry battalion, the LAW can be issued in whatever quantity is required by the tactical situation.

COST

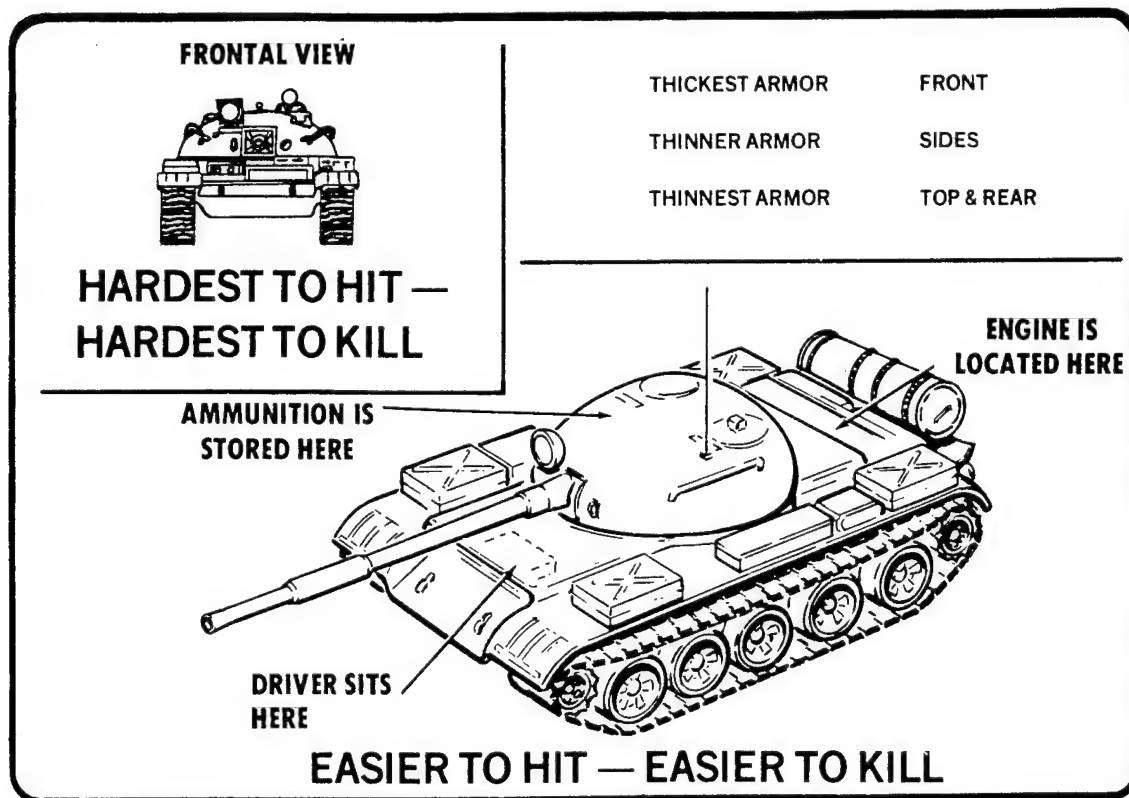
— about \$60 per round (rising with inflation)

HIT AND KILL POTENTIAL

Target distance and speed affect the probability of hit and kill for the LAW, but target attack angles in relation to the LAW gunner can also produce wide variances in hit and kill probabilities.

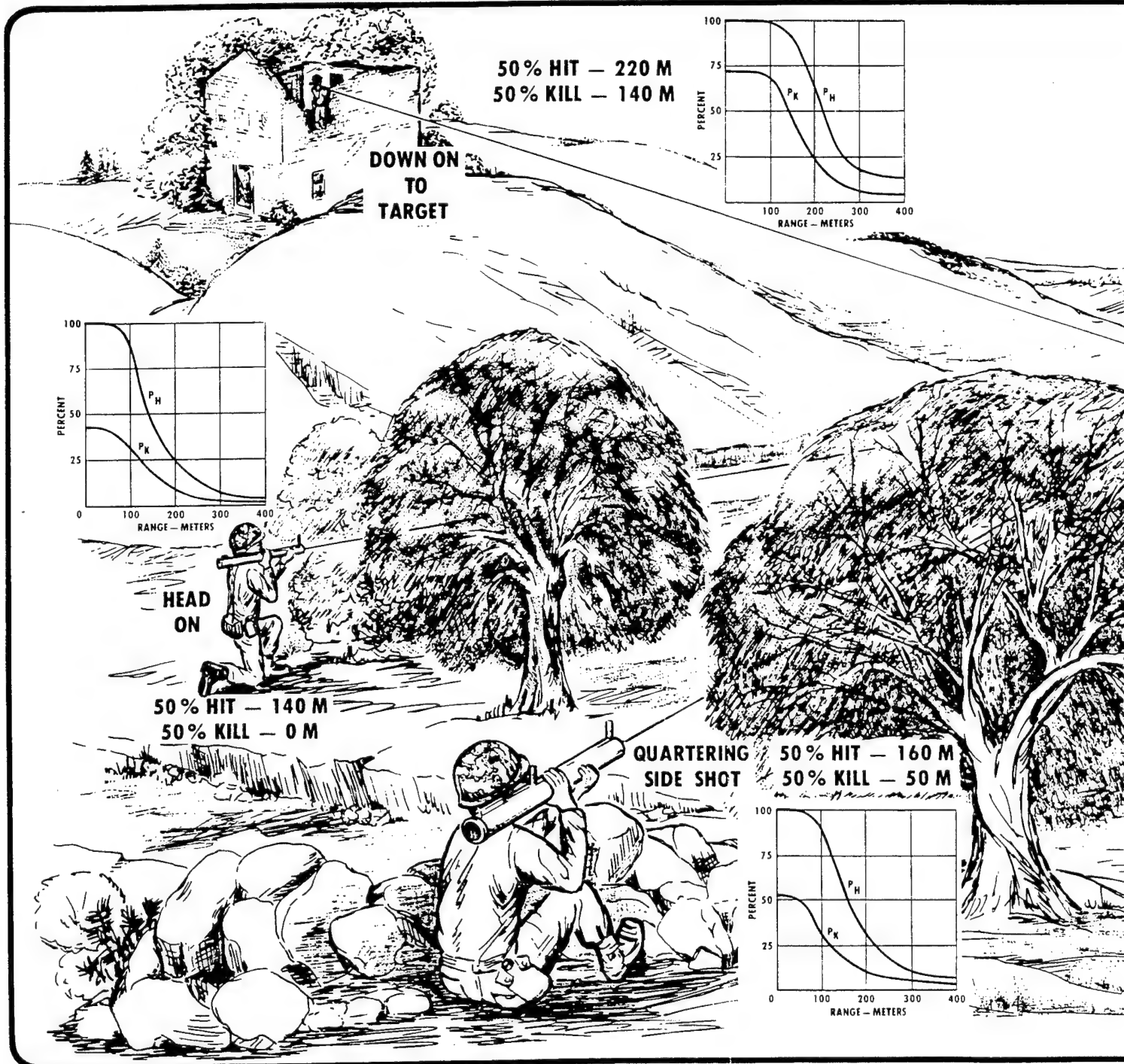
- The larger the cross section of the tank the gunner can see, the better his chances of hitting. Hence, a shot down on top of the tank affords the best target.
- Tank vulnerability depends on where the round strikes; the thinner the armor it hits, the less energy the LAW expends penetrating and thus has a greater possibility for behind-the-armor damage, such as, hitting the engine, the crew or stored ammunition. Tank armor protection varies from 8 to 9 inches on the front to as little as 1 to 2 inches on the top and rear.

Most tank armor protection patterns are similar to this:



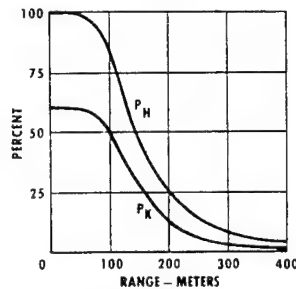
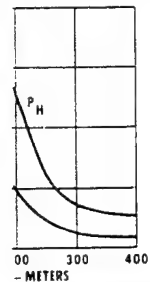
This is the gatefold between pp 8-9,
 TRADOC Bulletin 5 30 June 76

FIRST ROUND HIT AND KILL PROBABILITIES AGAINST A SOVIET TANK (AMS)

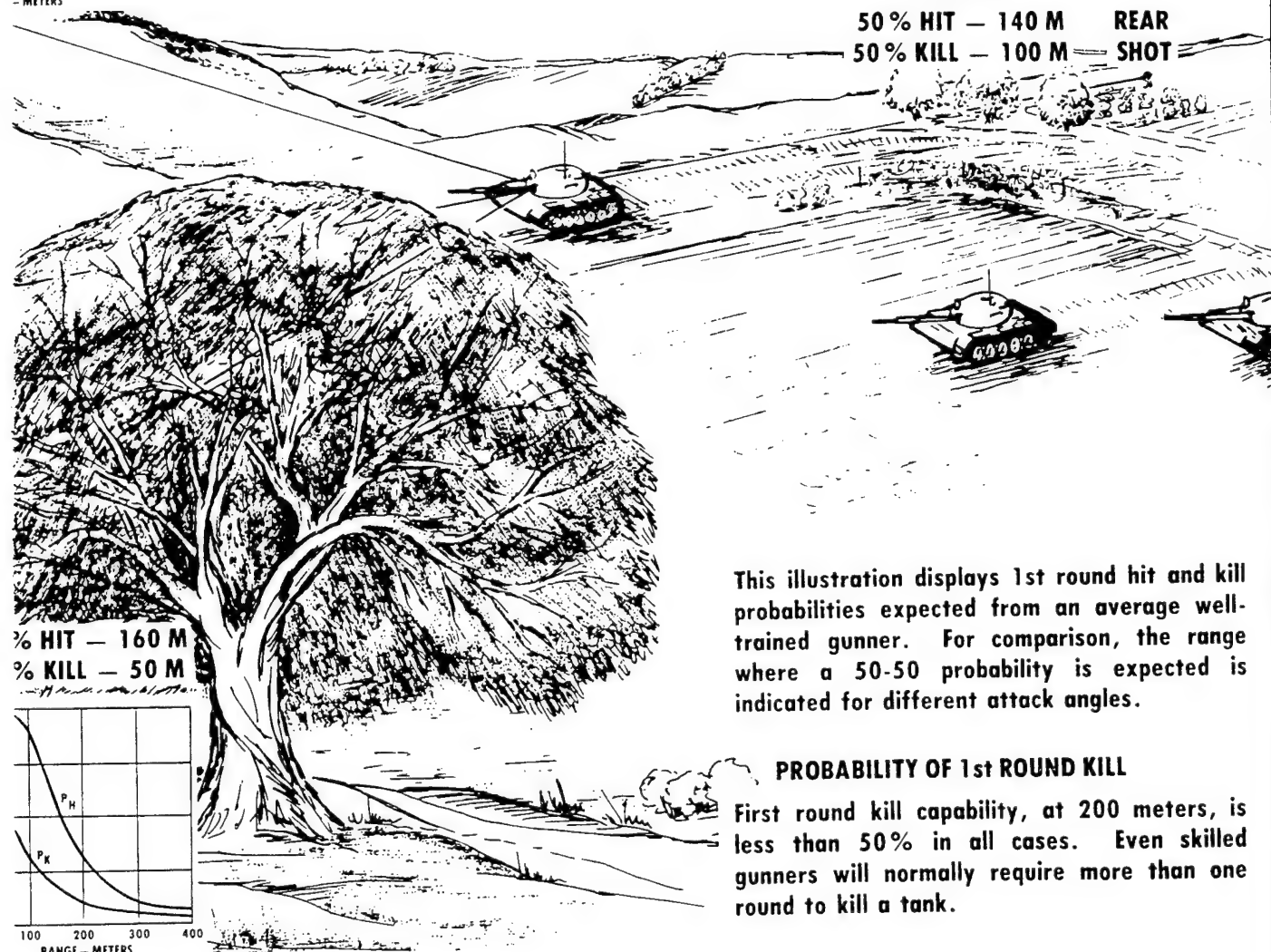


①

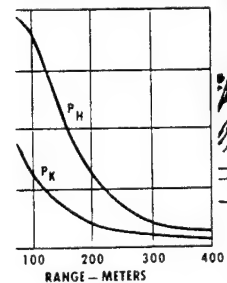
A SOVIET TANK (AMSAA DATA)



50% HIT — 140 M REAR
50% KILL — 100 M SHOT



% HIT — 160 M
% KILL — 50 M



This illustration displays 1st round hit and kill probabilities expected from an average well-trained gunner. For comparison, the range where a 50-50 probability is expected is indicated for different attack angles.

PROBABILITY OF 1st ROUND KILL

First round kill capability, at 200 meters, is less than 50% in all cases. Even skilled gunners will normally require more than one round to kill a tank.

2

Because tank armor is thinnest on top, shooting down onto a tank gives LAW its best prospects for a kill. Also, because seen from the top, a tank presents its broadest cross section, firing down on a tank produces a marked increase in hit probability.

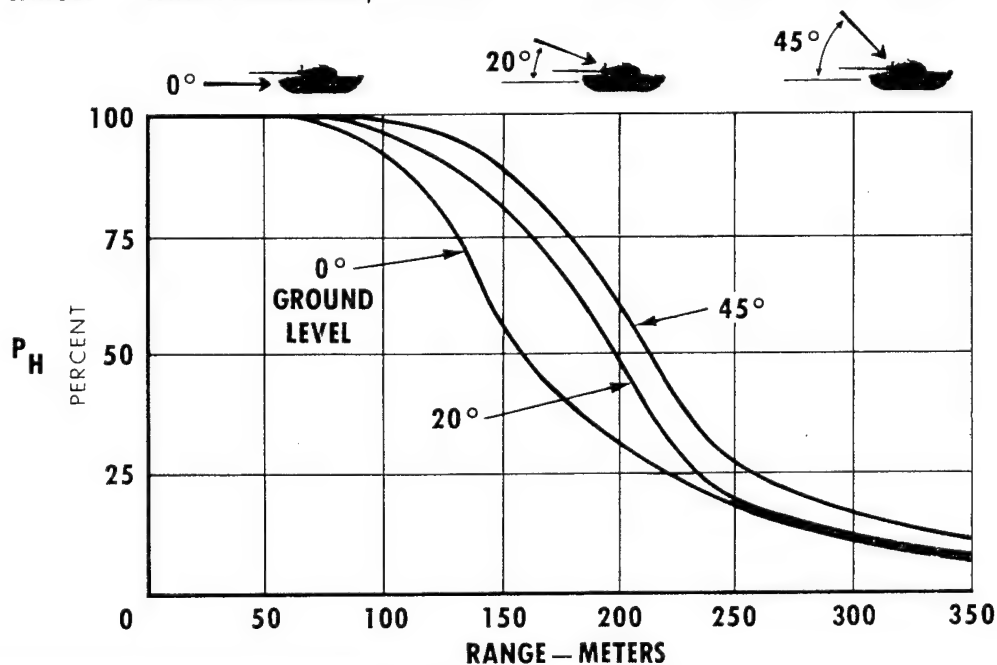
This graph illustrates the advantage of *elevated firing positions*:

- Firing angle of 20° increases the chance of a hit by 2/3 at 200 meters.
- A 45° angle doubles the 1st round probability of hit when compared to a ground level shot.

1st ROUND HIT PROBABILITY (FIRING ELEVATION ANGLES)

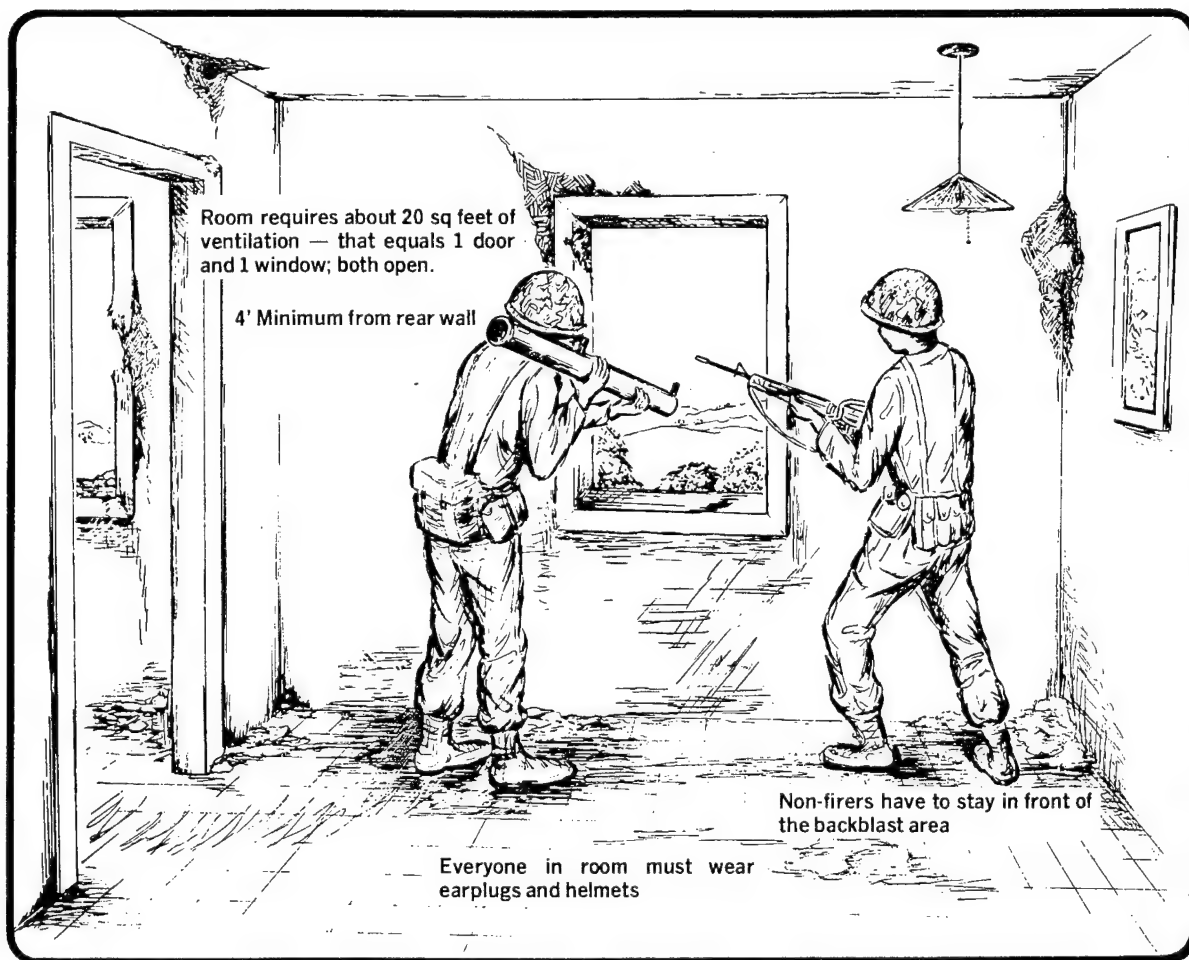
TARGET — TANK STATIONARY, EXPOSED

ATTACK ANGLE — 30° AZIMUTH



FIRING FROM INSIDE BUILDINGS AND BUNKERS

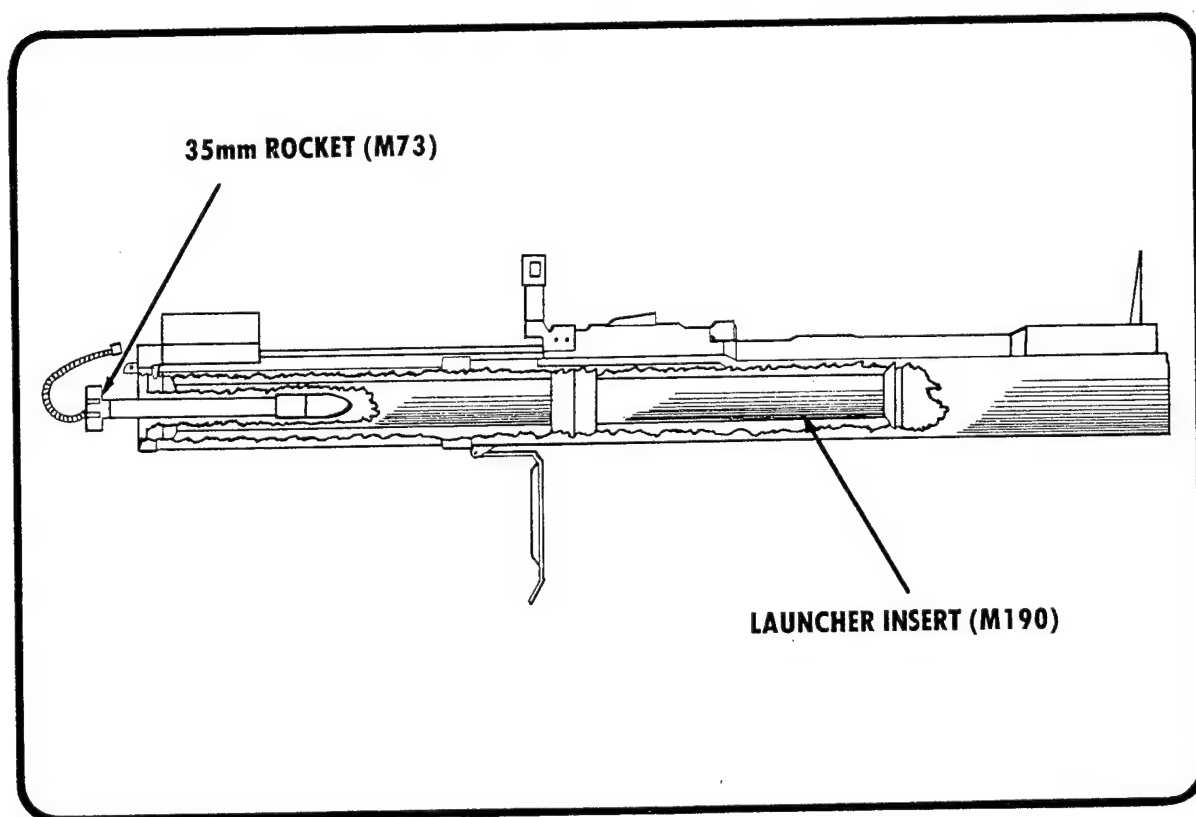
One of the myths about LAW use was it could not be fired from inside buildings. LAW does produce a dangerous backblast when fired and gunners must account for that, particularly in peacetime training. But, IN COMBAT, LAW *can* be fired safely from inside buildings and bunkers with overhead cover if a few safety precautions are observed. The safety precautions noted below were confirmed recently by tests conducted by the Human Engineering Laboratories at Aberdeen Proving Grounds.



The test also showed that the weapon firing signature was not visible when the LAW was fired from inside a building. In fighting in towns, LAW can be central to tactics.

THE LAW SUBCALIBER TRAINING DEVICE

Because LAW is a weapon designed to be fielded in large numbers, its combat potential is directly related to the number of soldiers trained to fire it. If we had to rely solely on the service round for peacetime training, we could find it difficult to bear the cost of training in an era of rising ammunition prices. The LAW, however, is provided with an effective subcaliber training rocket which, at \$4.70 a round, permits realistic training at less than 10% the price of a service round.



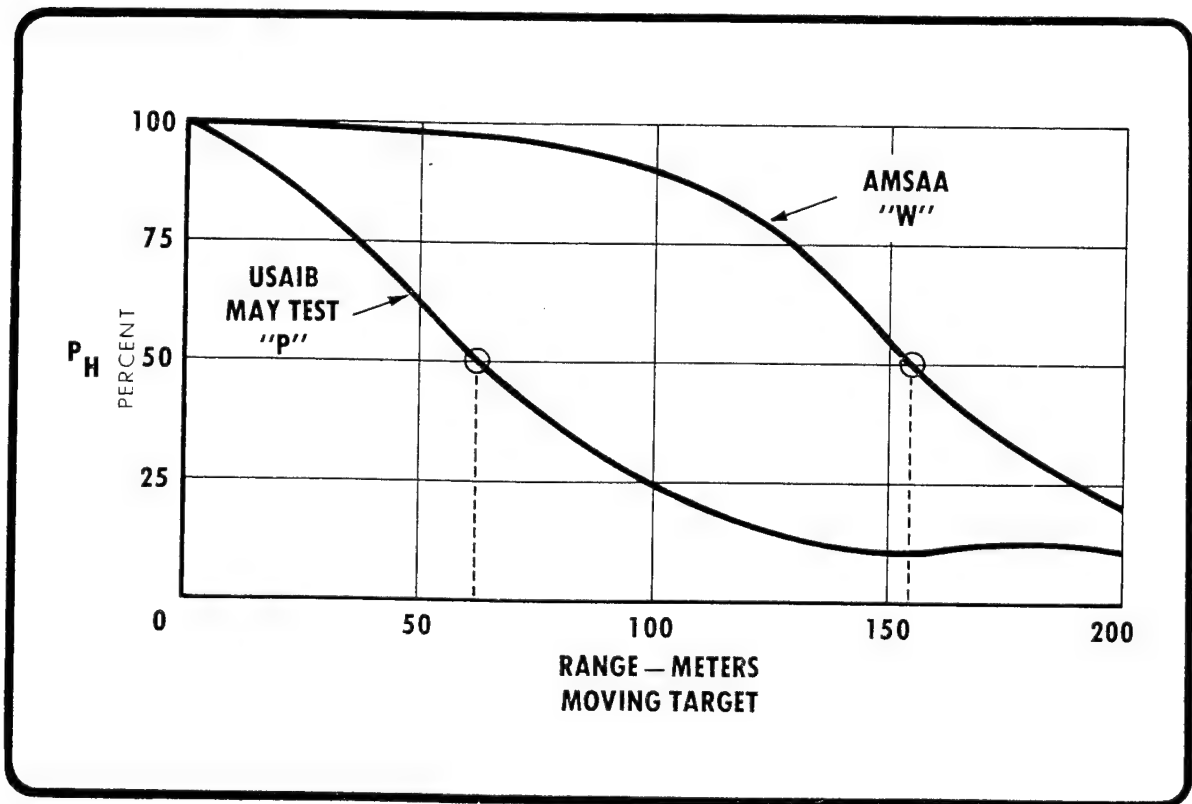
The subcaliber device consists of a launcher insert (M190) which is fitted inside an expended LAW service round. The 35mm rocket (M73) is then loaded into the launcher and fired in exactly the same way as the actual round. The rocket has a trajectory closely matched to the HEAT round. The M73 rocket produces noise, smoke, and a modest blast when fired, and impacts the target with a flash, noise, and a puff of white smoke. Additionally, the subcaliber round can be fired safely at a manned moving tank which has been shielded to protect breakable parts. LAW training does not require elaborate ranges or fixed facilities.

IV ANALYZING GUNNER PROFICIENCY

In May 1974, the US Army Infantry Board conducted a LAW field firing test using a group of soldiers randomly selected from the 197th Infantry Brigade at Fort Benning.

Prior to the test, the soldiers were trained by Infantry School experts using the 4-hour Army Subject Schedule for LAW training. These soldiers probably received the best training the Army could provide and their firing results represent an **optimistic** view of soldier capability Army-wide.

Hit results against moving targets from the May test are plotted below and compared with AMSAA expectations about system performance. *Within the 200 meter range band, the test firers achieved an overall hit capability less than half that engineered into the LAW.*

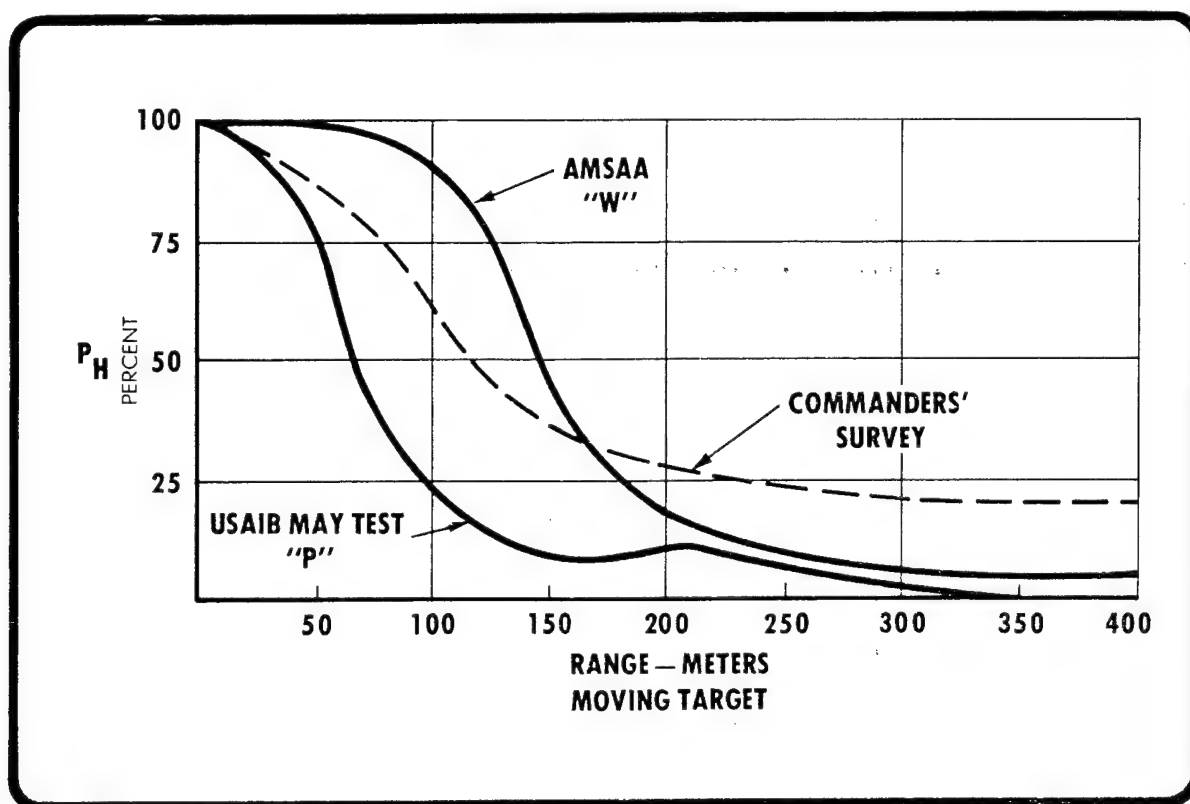


Note that AMSAA predicted a 50-50 probability of hit at 160 meters, but the soldiers in the test had only a 10% probability of hit at that range.

LAW PROFICIENCY IN UNITS

As a part of the LAW analysis, the Combat Arms Training Board conducted a field survey of 24 battalion and company commanders in four of our CONUS divisions, asking these commanders to evaluate LAW proficiency in their units.

The commanders were optimistic. Plotting the commanders estimates of LAW hit probability against moving targets showed that they believed their soldiers could fire considerably better than the trained soldiers in the May test actually fired.



Note also that the commanders thought the LAW was effective out to 400 meters, and judged their soldiers to be at least twice as effective at 300 meters against a moving target than AMSAA predicted.

This over-optimism by the commanders reflected the widely held view that LAW required little or no training. A survey of LAW training in their units showed the effect of that view:

- Less than one third of their soldiers had any training at all on the LAW.
- Only half of those trained had fired at moving targets.

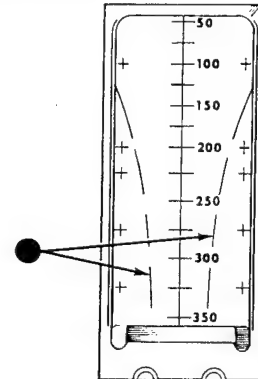
MOS TEST RESULTS

Soldier training with LAW, Army-wide, is probably similar to that indicated by the unit surveys. Military Occupation Specialty Test results provide an insight into overall Army proficiency. In the November 1974 MOS tests for light infantrymen (MOS11B) soldiers were asked two very basic, but key questions about the LAW.

RANGE ESTIMATION

You are sighting on a tank which is moving toward your position with the M72A2 LAW. You should use the curved lines of the sight to estimate the

- A. range
- B. speed
- C. leads
- D. approach angles

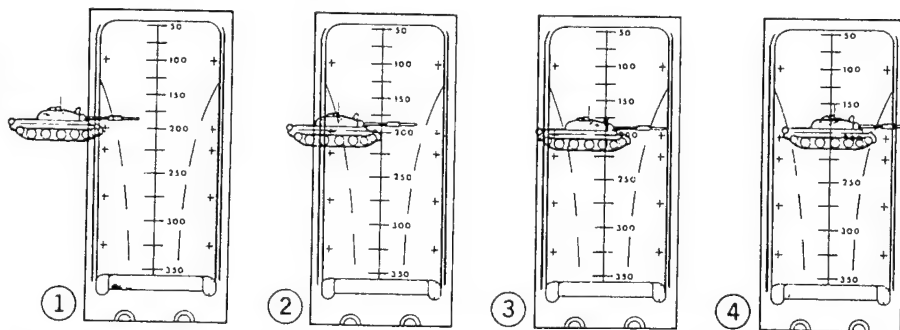


Only 46% of the Infantry soldiers tested knew that the stadia lines were used to estimate range.

ESTABLISHING A LEAD FOR A MOVING TARGET

Which illustration shows the correct sight picture for the M72A2 LAW which is engaging a tank moving from left to right with an apparent speed of 15 mph at 200 meters?

- A. 2
- B. 1
- C. 4
- D. 3



Only 27% answered correctly—about the same percentage expected from random guessing.

The question was a repeat from the 1973 MOS test in which 26% answered correctly.

THE EFFECTIVENESS GAP

The May 74 LAW test showed that the Army was losing a significant part of its tank killing capability through inadequate training. That training produced a measurable Effectiveness Gap between weapon capability and actual performance.

Moreover, the commanders' over-optimism could lead, in combat, not only to reduced battle effectiveness, but also to the tactical commitment of soldiers which dangerously exceeded their capabilities.

WHAT CAUSED THE EFFECTIVENESS GAP?

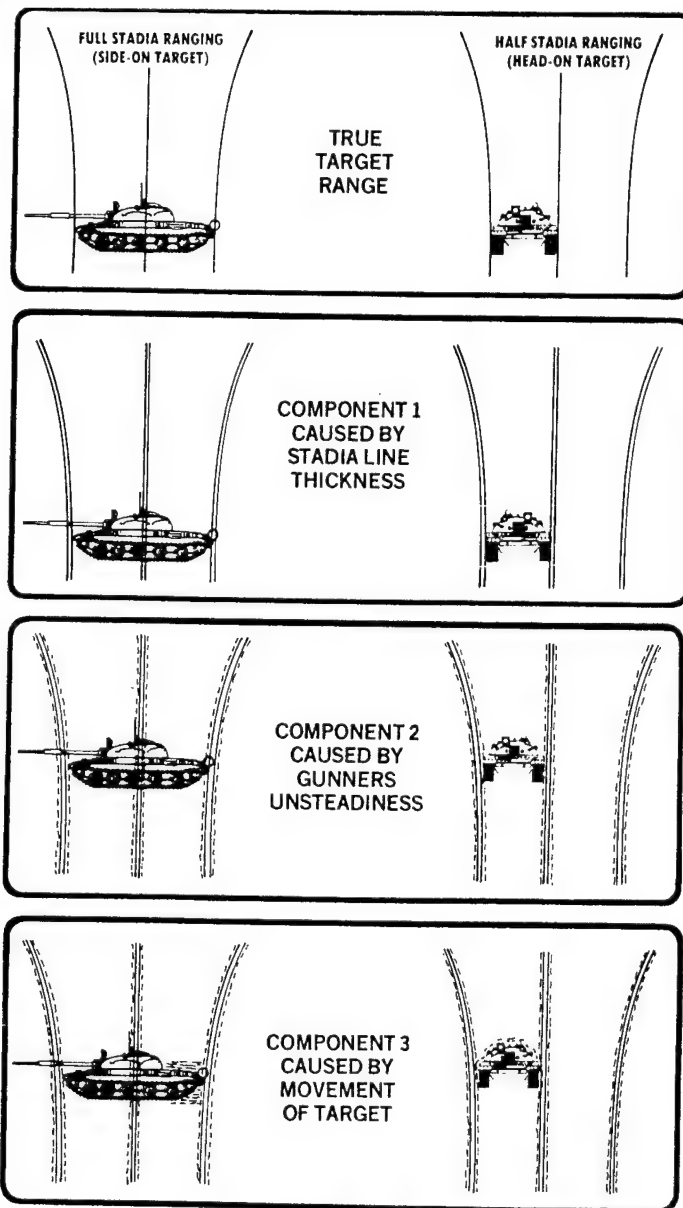
Since it appeared that the 4-hour program did not produce LAW gunners who could attain a high level of effectiveness, even with the best instruction available at the time, the next step was to find out why.

An analysis of three tests conducted since May 74 indicates that the effectiveness gap was caused by three main factors:

- A. Inability to range using the stadia.
- B. Inability to properly engage moving targets.
- C. Training emphasis placed on the wrong skills.

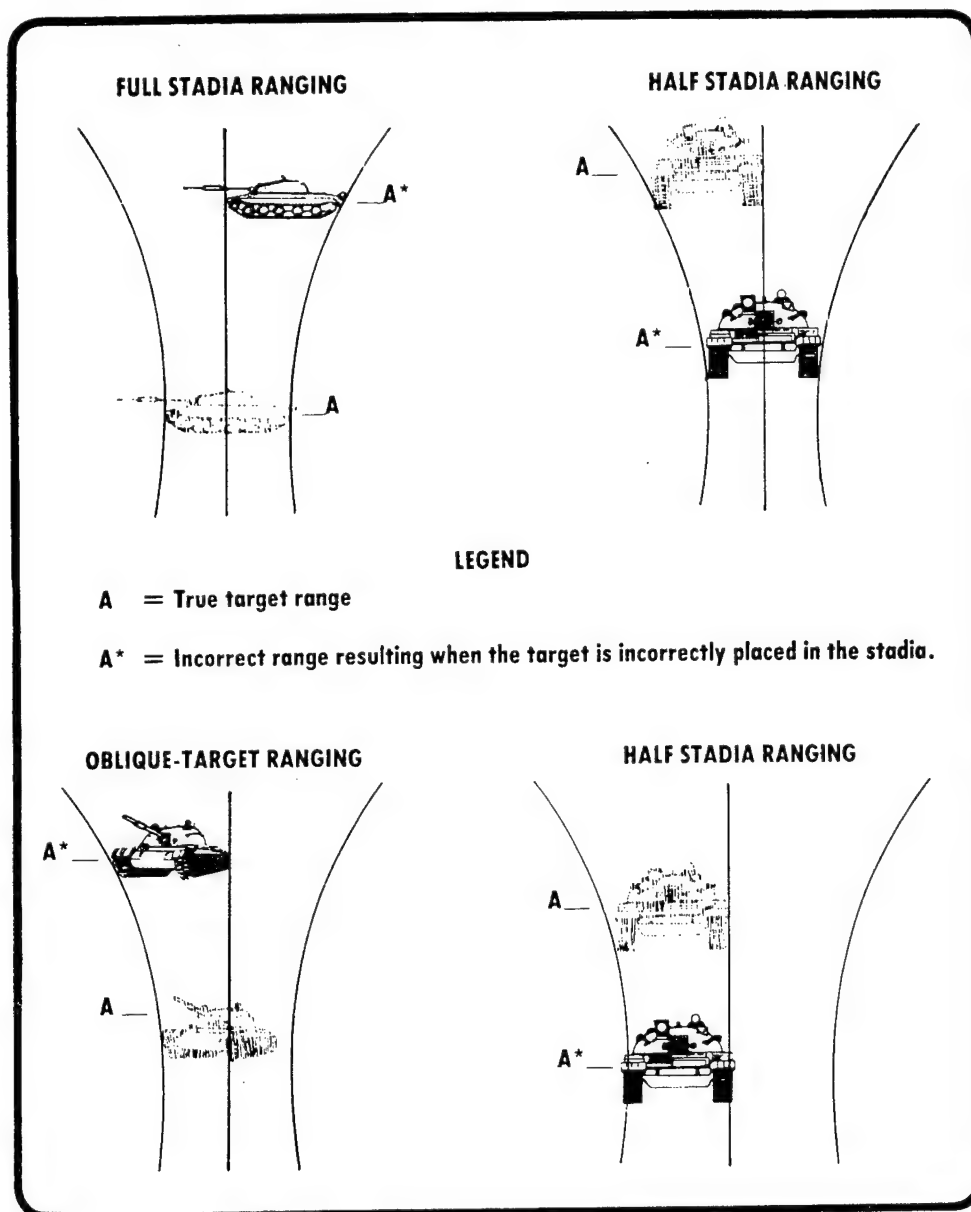
A. RANGING WITH THE STADIA

A test conducted by the Human Engineering Laboratories (HEL) examined the problem of the LAW stadia sight. Analysis of the sight produced this picture of "normal" problems associated with target ranging:



NOTE: These three factors — stadia line thickness, gunner unsteadiness and target movement — produce a constant 5% range error and cause the gunner to underestimate target range, even when he uses the sight correctly. The problem is more severe for a head-on target.

When a gunner does not understand how to use the sight (not well trained), he further compounds the "normal" ranging problems. Recall that less than half of the soldiers taking the MOS test did not know the purpose of the stadia lines. Below we can see the added errors induced when the target is *incorrectly* placed in the stadias.

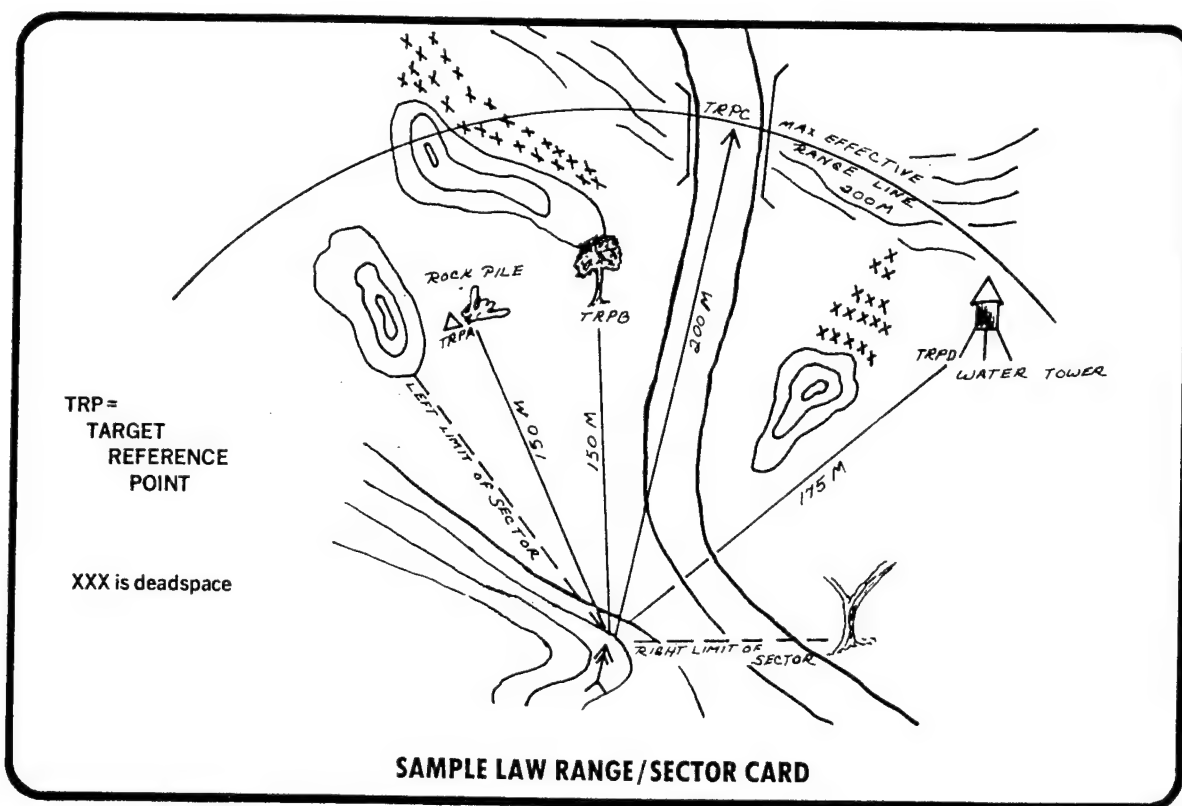


One of the most serious problems with the stadia lines is that they don't exist for ranges where our best chances (highest probability) for a hit are achieved. They disappear off the sight at 135 meters. Soldiers who try to imagine an extension of them only compound the ranging problem.

One solution to all these problems is to ignore the stadia lines. That leaves two alternatives for target ranging: let the gunner use his own visual range estimate, or prepare range/sector cards ahead of time.

Visual Range Estimation. Three separate studies have concluded that the range estimate of the average soldier will be in error by about 20 percent. At a range of 200 meters, a 20 percent error will cause the mean impact of the round to rise or fall less than 12 inches from the aim point. This small miss distance should have little impact on hit probabilities.

Range/Sector Cards. When time is available, pacing distances to known reference points (boulders, trees, road junctions, etc.) and recording them on range cards can be of significant assistance to the gunner.



Tests concluded at FT Benning in January 76 demonstrated that the range card method produced significantly higher hit probabilities than the visual range estimation method, and both were better than using the stadia lines for ranging. *When ranges were known before firing, the probability of hitting a moving target at 200 meters doubled.*

B. ENGAGING MOVING TARGETS

Studies conducted by the Human Engineer Labs and the Infantry School identified three problems associated with engaging moving targets.

- Bracketing apparent speed into 3 groups is too difficult.
- Lead rules were too complicated.
- Improper steady hold techniques.

The lead rules presented in FM 23-33 require the gunner to estimate the apparent speed of the vehicle (movement perpendicular to the soldier's line of sight) and discriminate if the speed is 5, 10 or 15 mph. Even with exhaustive practice, soldiers were unable to determine these "speed bands" with any consistency.

Compounding the problem is the fact that existing training literature prescribes sighting rules which are too complicated for the average gunner to perform to engage moving targets.

The LAW trigger varies from round to round in the amount of pressure required to fire the weapon. In analyzing films taken of test soldiers, it was found that those soldiers who could assume a correct firing position and properly apply the steady-hold factors could compensate for variances in trigger pressure. Conversely, the films also show that soldiers who consistently missed targets were unsteady, did not lead the target with a smooth motion, or jerked the weapon off target as they fired. To overcome this problem of correctly applying pressures (steady-hold), the soldier must repeatedly practice the proper firing techniques.

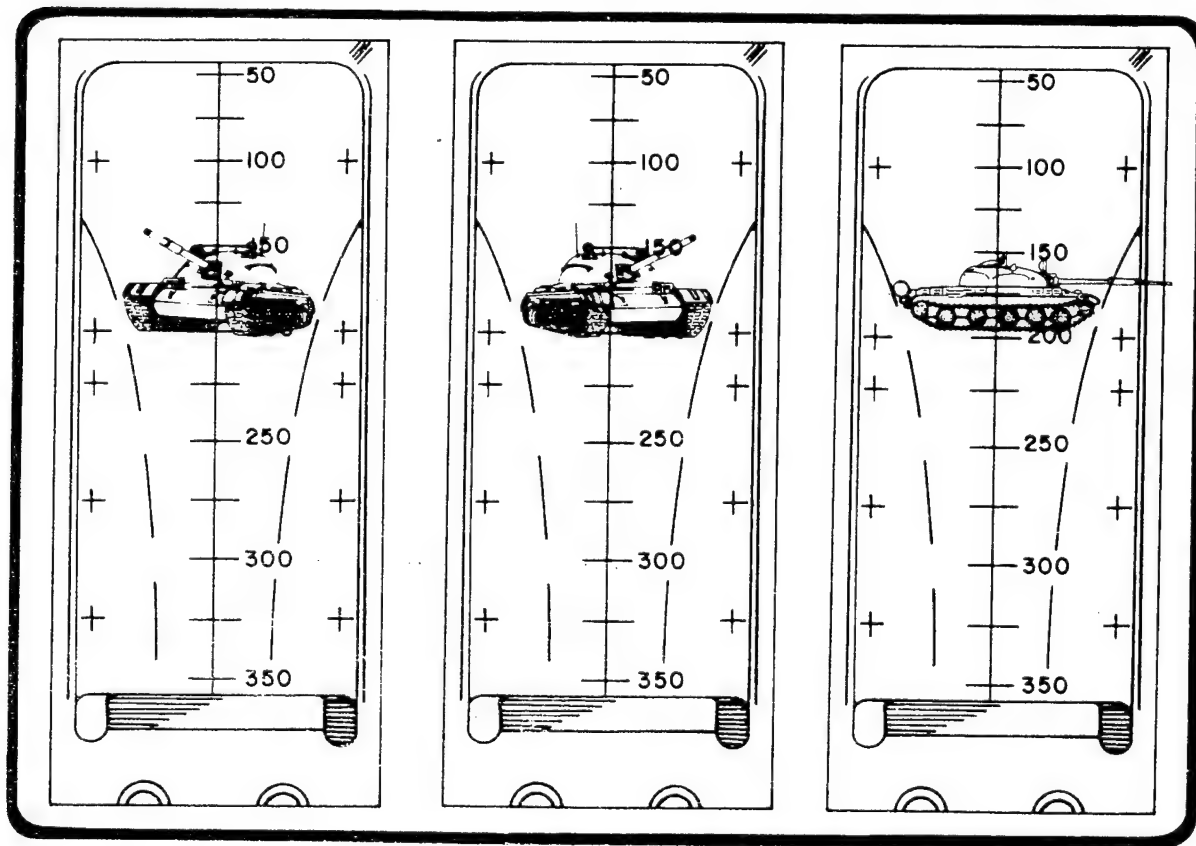
THE REVISED GUNNERY RULES

LAW gunnery training problems identified in the Ft Benning tests of May 74 were reverified in further tests conducted in October 74.

From June 75 to January 76, Ft Benning conducted extensive testing of a revised training program using simplified sighting rules. The following rules have been adopted and will be incorporated as changes to existing training literature in the near future.

STATIONARY TARGETS

1. Determine the range to the target by visual range estimation or by using a range/sector card.
2. Set that range mark on the vertical range line, place that point on the center of mass, and fire.



Sight Pictures — stationary targets 175 meters from gunner's position.

MOVING TARGETS

1. Estimate the speed of the target across your front. Estimate speed as *slow* (approx. 5 mph or less) or *fast* (any speed greater than 5 mph).

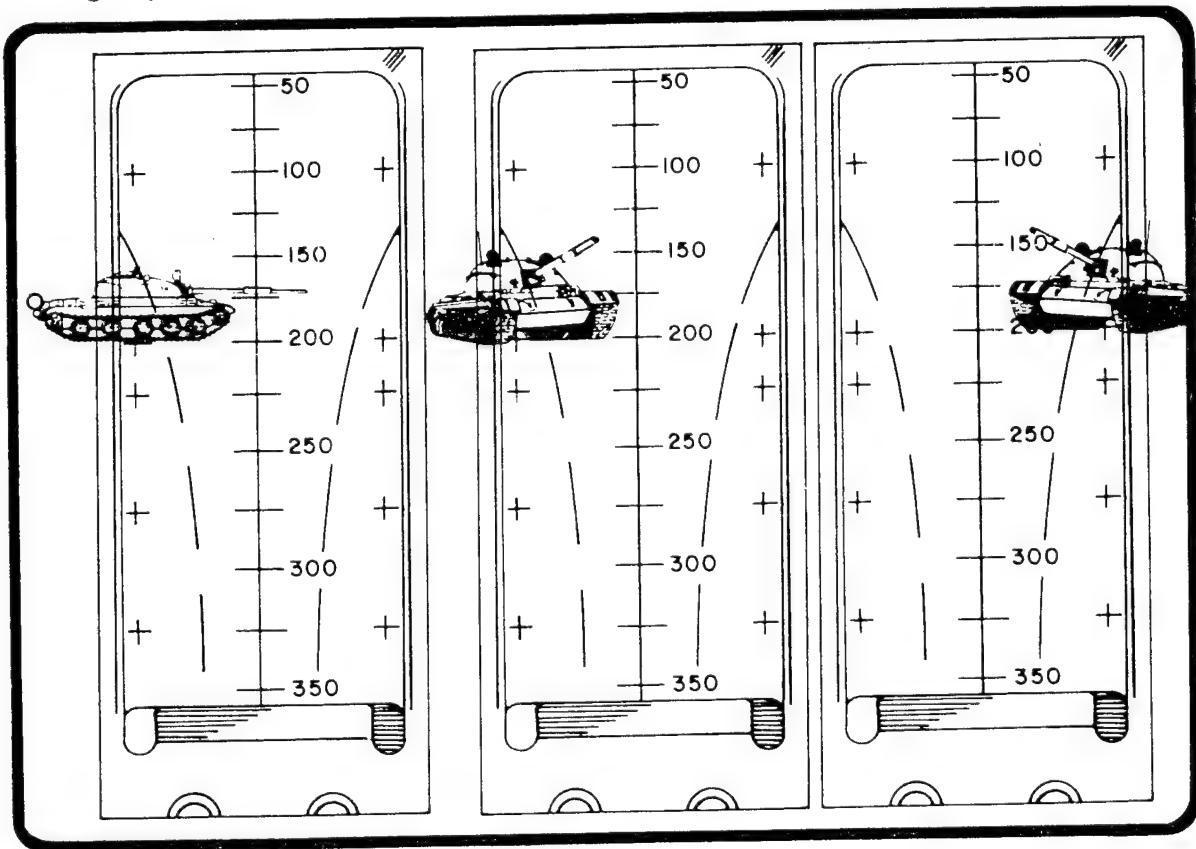
(a) Front/rear view: assume 0 speed and use stationary target rules.

(b) If more of the front or rear of the target is visible than the side (target approaching or leaving from 11 or 1 o'clock), assume the target speed is slow.

2. Estimate the range to the target (same as for stationary target).

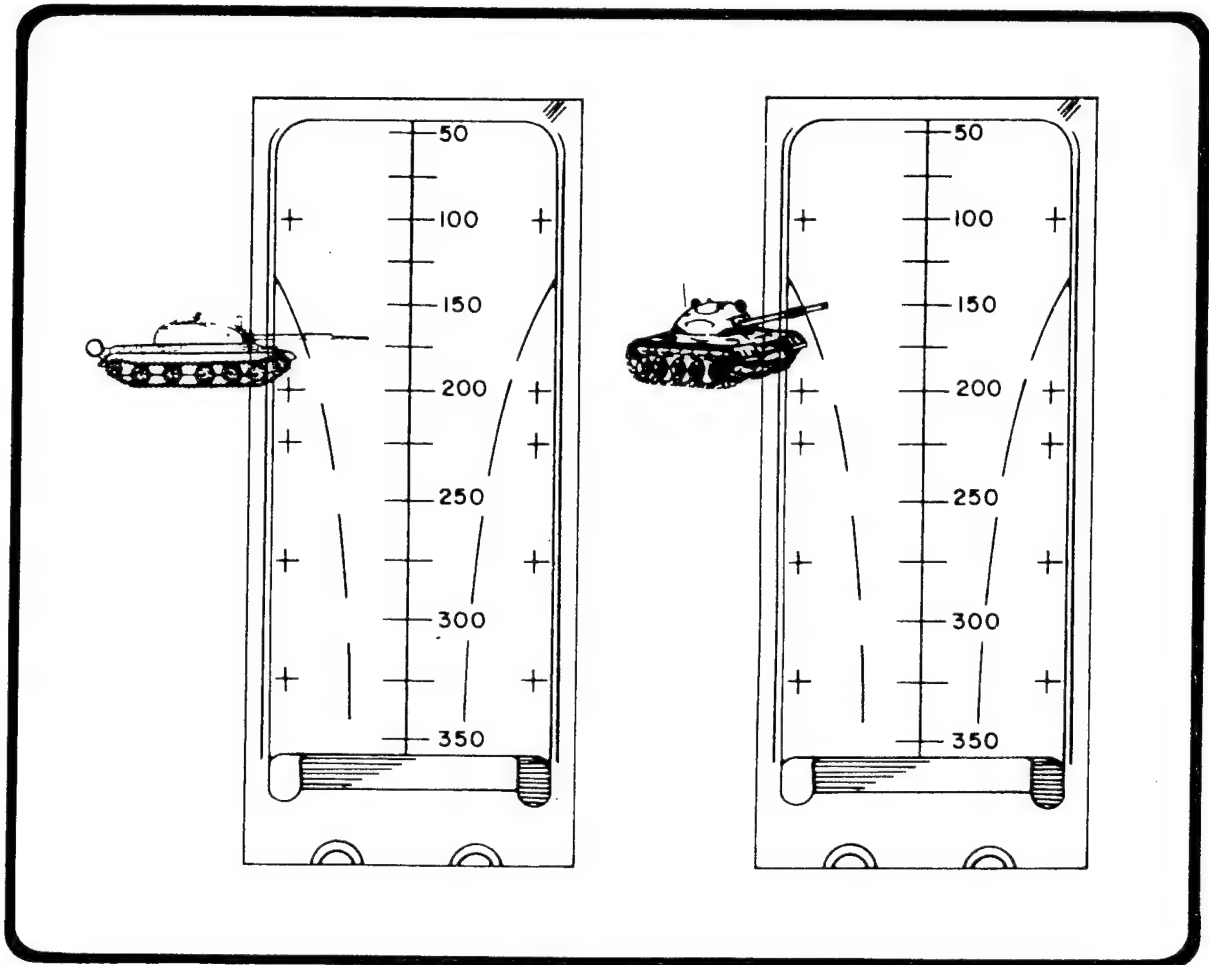
3. Slow Moving Targets: Locate your estimated range on the vertical range line, place the *lead cross* at that range mark and on the *center of mass* of the target, and fire.

NOTE: Be sure the vertical center is in front of the target. If there is no lead mark at that range, use an imaginary line drawn through the lead crosses.



Sight pictures — slow moving targets 175 meters from gunner's position.

4. Fast Moving Targets: Locate your estimated range on the vertical range line, place the *lead cross* at that range mark and on the *front leading edge* of the target, and fire.



Sight pictures — fast moving targets 175 meters from gunner's position.

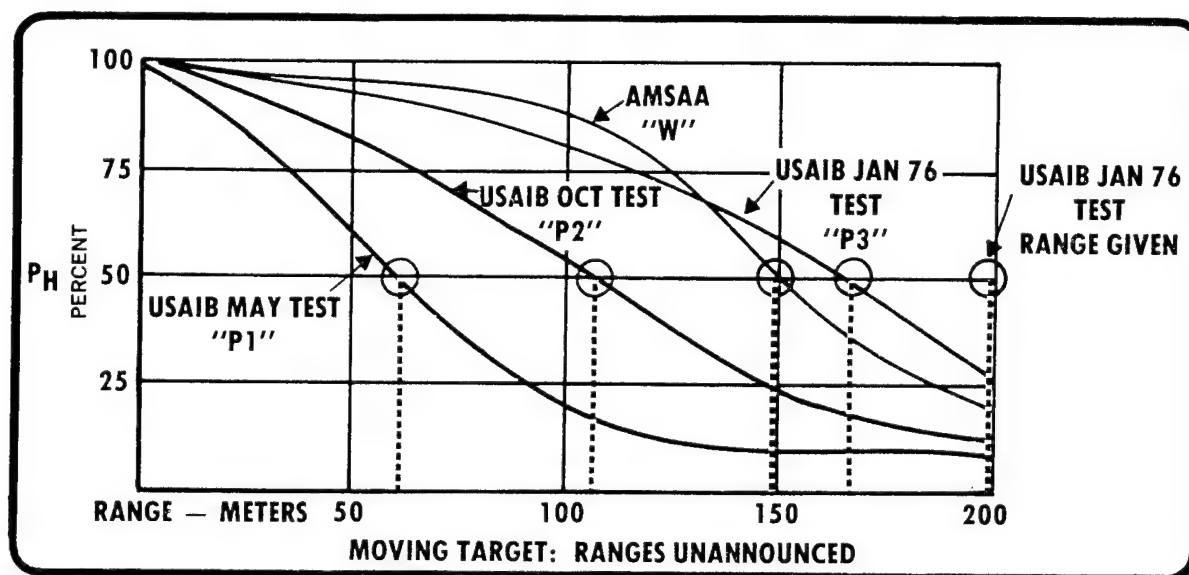
C. TRAINING EMPHASIS

The new, simplified rules can be taught more rapidly, and emphasis can be placed on visual range estimation, determining fast-slow speed bands, and firing the weapon or its subcaliber device.

THE SEARCH FOR IMPROVED TRAINING

Having identified the problems in the May 74 test, the Infantry School set about revising the training program. Results of tests of a revised program conducted in October 1974 showed a significant improvement over the May results, but still less than the weapon's capability determined by AMSAA. During the Spring of 1975, experiments were designed to test alternative training programs and sighting rules. Results of those tests, completed in January 1976, have led to the adoption of the new gunnery rules previously discussed, and a revised training program to be distributed to the field in the near future.

IMPROVED TRAINING MADE A DIFFERENCE



Individual proficiency in the crucial task of hitting moving targets increased over the entire 200 meter range band. The average 50-50 hit probability moved from a range of about 60 meters in the May 74 test to well over 100 meters in October 74, and to nearly 165 meters in the January 76 test. When accurate range data was available to the gunner (range card), the 50-50 hit probability was over 200 meters, twice the probability of when the range was estimated.

The January 76 results were actually better than the AMSAA prediction for ranges between 140 and 200 meters. Although less than the AMSAA "W" for ranges under 140 meters, the results are not directly comparable due to different target approach angles at these ranges. The January test used a more difficult oblique angle of approach.

The January test confirmed that the Effectiveness Gap between the actual firing results in the May test and AMSAA predicted capabilities could be closed by better and more realistic training.

WE HAVE A LONG WAY TO GO

Although the results of the January 76 test are encouraging, recall that they have been achieved by only a small group of test soldiers at Ft Benning. The overall proficiency of the Army in LAW gunnery is probably down somewhere near the May 74 levels. A priority effort is underway to distribute the new training program to the field. Commanders can double their short range antiarmor capability by insuring that the tasks, conditions, and standards therein are mastered (estimated average time to achieve proficiency is about 6 hours), and refresher training is scheduled frequently to maintain proficiency and combat readiness.

V ANALYZING LAW TACTICS

So far in this Bulletin we have looked only at the results of training on single shot probability against stationary and moving targets. Earlier we said that tactics are important in battlefield effectiveness. In the case of the LAW, there are several ways to increase effectiveness through tactical employment. One tactic is to employ mines and obstacles, or other means to cause tanks to slow or stop and thereby make them an easier target. As we have seen, shooting down from buildings is a sound technique, especially in towns where the streets canalize tank movement, and range estimation is easy. But any gorge, cut, or other defile could offer similar advantages.

Another tactic is to employ LAW in large numbers. By increasing the number of LAW in a squad, for example, several gunners can gang up on a single tank, or one gunner can fire more than once at the same tank. In either case, with plenty of LAW on hand, the gunners can continue firing until the tank is killed.

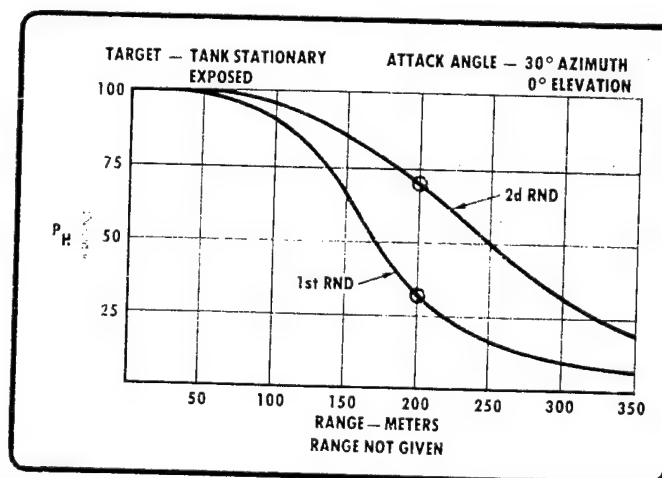
In the defense or an ambush situation, gunners firing at multiple, known distance targets can do great damage to an armored force if properly distributed, interlocked, flanking fire from good positions with frontal cover are used.

Before we look at the test results of multiple round shots, we need to establish a basis for comparing effectiveness using AMSAA data for second round probabilities.

SECOND ROUND HIT PROBABILITIES (FIRST ROUND MISSED)

AMSAA predicts that a LAW gunner can significantly improve his range estimation for a second shot by adjusting from the burst of the first round.

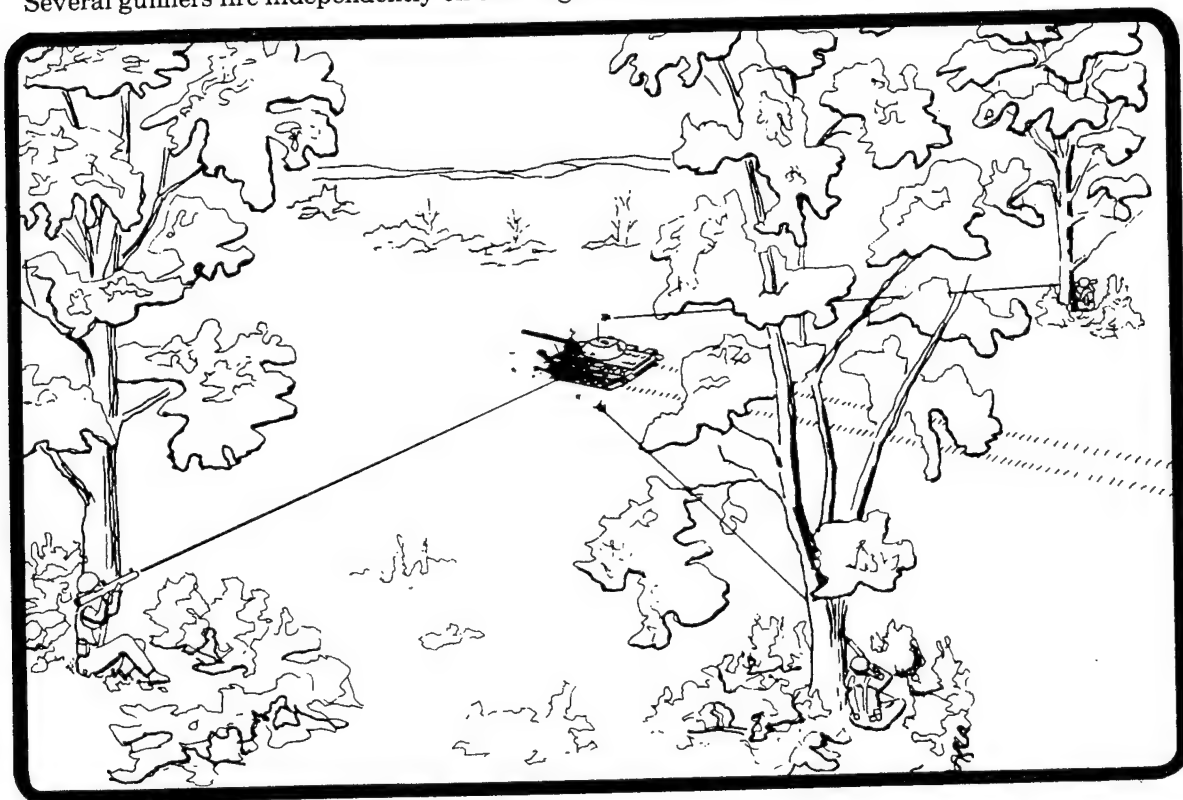
This chart illustrates the increase in hit probability with improved range estimation. For a target at 200 meters, the gunner doubles his chance of a hit on the second shot.



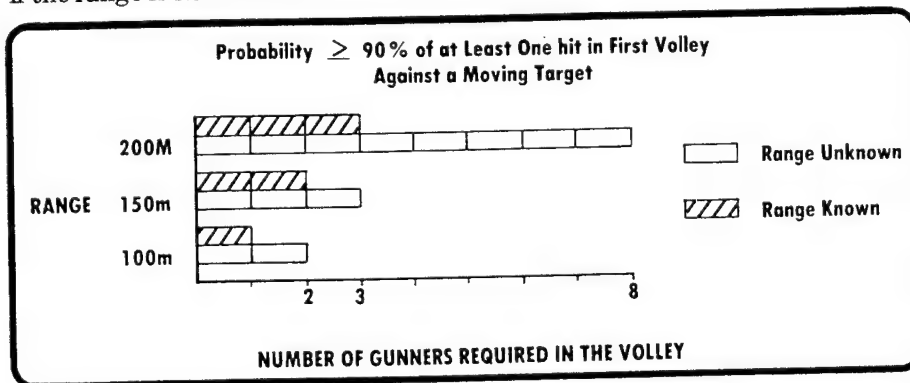
The LAW tests looked at three methods for engaging targets with multiple rounds.

1. VOLLEY FIRE

Several gunners fire independently on one target at the same time.

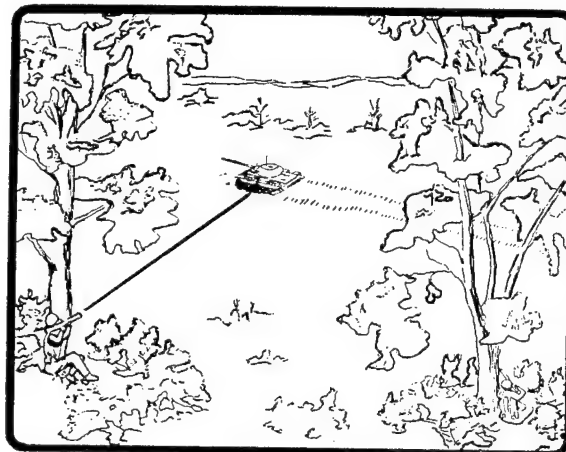
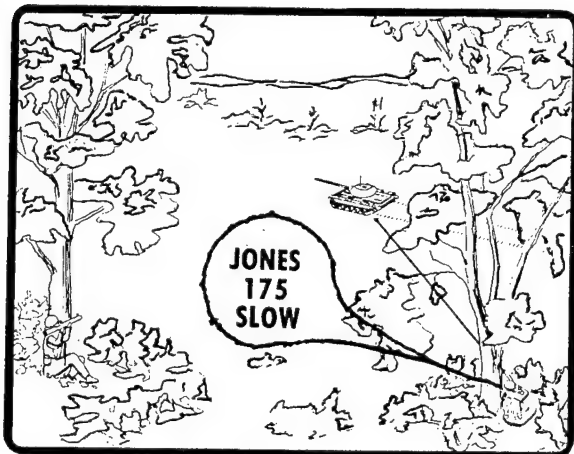


- Probability of hit is the same for each gunner firing at the same range.
- Good method when targets appear one at a time at close to medium ranges, *but*,
 - It could result in improper fire distribution if more than one target appears.
 - It requires a large number of firers to insure (90 percent probability) at least one hit on the first volley if the range is not known.



2. PAIR FIRE

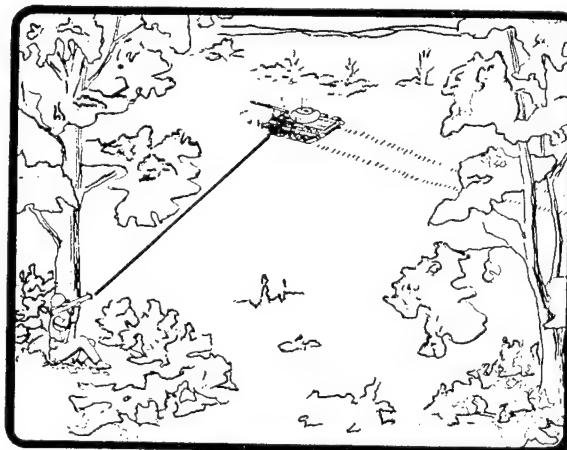
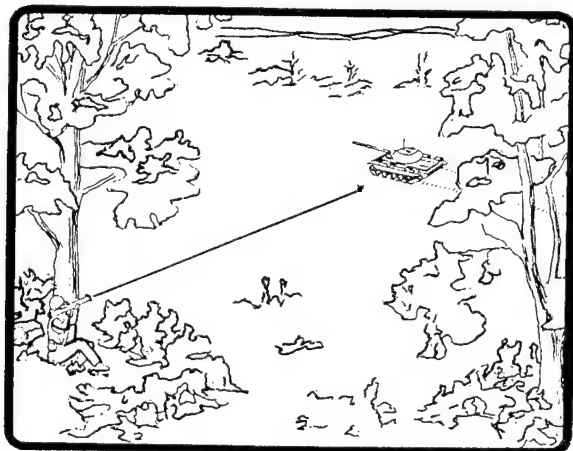
Two gunners form a team. Both gunners sight on the same target and one gunner calls out his range estimation and lead. That gunner fires a round while the second gunner observes. When the first round impacts, the second gunner adjusts his range and lead and immediately fires the second round.



- Good technique for any range.
- Can result in better fire distribution than volley fire when multiple targets appear.
- Conserves ammunition when ranges are unknown. Uses less rounds to insure (90% probability) at least one hit at 200 meters. Four rounds per pair versus the eight rounds needed in volley fire.
- Quicker. One gunner can be sighting while the other is preparing another round.

3. SEQUENCE FIRE

One gunner fires and observes first round impact, picks up a second LAW, corrects his range and lead, and refires.

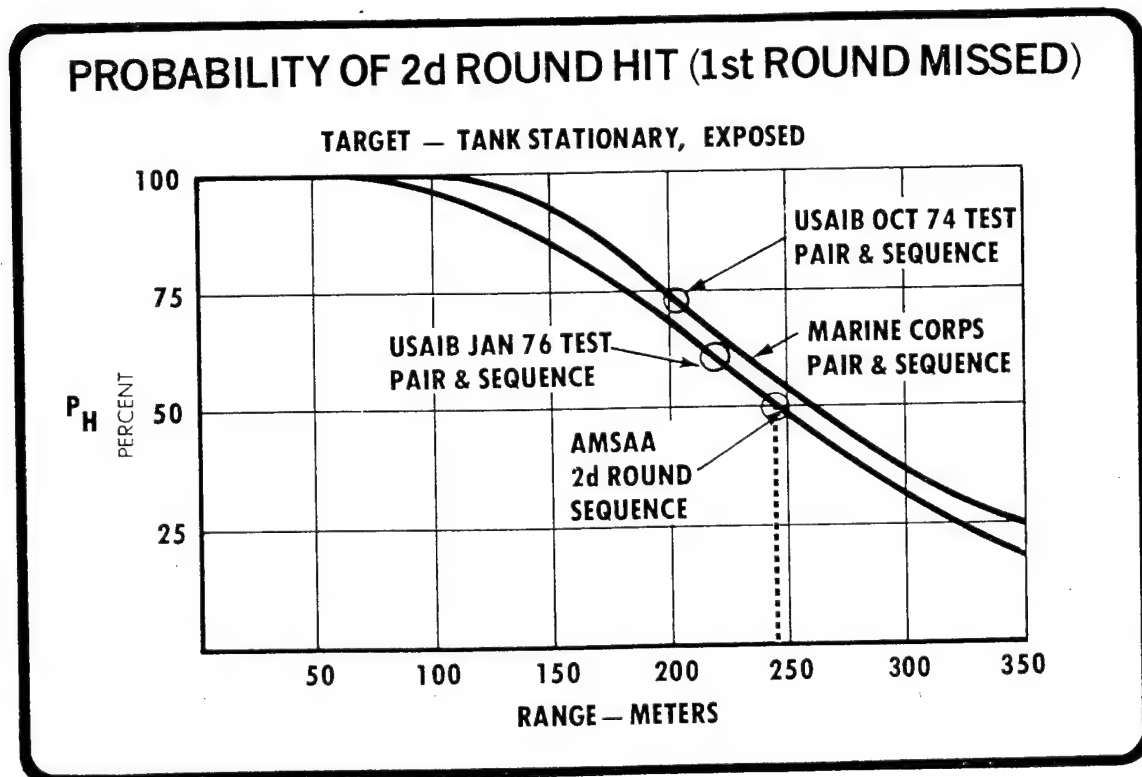


- A variation of the pair technique. Instead of correcting from another gunner's burst, firer corrects by sensing his own first round.
- Used by each gunner in a volley when volley fire has not resulted in a kill.
- Slower than the pair technique.
- Use when the pair technique is impossible (physical separation, noise, different sectors of fire, etc.)

Several years ago, the United States Marine Corps experimented with pair and sequence firing and confirmed that these techniques worked. Marine results on the second shot were better than AMSAA 2nd round predictions.

The tests at Ft Benning also recorded similar benefits from pair and sequence techniques.

At 200 meters, pair and sequence techniques enable firers to reach or exceed the AMSAA value for second round hit.



HOW MANY LAW ARE ENOUGH?

The answer to this question is situation dependent. Are you attacking, defending, ambushing? What is the armor threat? Armor avenues of approach to your position? Suitable fields of fire for the LAW? Expected firing ranges? Availability of time to prepare range cards?

Imagine this "tight situation" scenario. An infantry squad of 11 men is defending a flank of a company defensive strongpoint. They have had time to dig-in in two man positions behind trees providing good frontal cover, on a hill overlooking a field with unrestricted fields of fire out to a treeline 250 meters forward. Sufficient boulders and shrubs are in the field to allow each man to prepare a good LAW range card.

The squad leader catches glimpses of a column of armor vehicles moving on the other side of the treeline. The adjacent company has been smoked and can't engage them effectively. He reports to his platoon leader, requests a preplanned artillery FPF and shouts for the squad to prepare the four LAW that each man has in his position. Suddenly the vehicles pivot, and breaking through the treeline is a line 150 meters wide of four T-62 tanks followed close behind by ten BMP — a reinforced company team of a motorized rifle battalion charging at max speed. Their intention is to overrun the squad's position and roll up the company flank.

IT WILL TAKE THEM ABOUT 45 SECONDS TO REACH THE SQUAD'S POSITIONS.

Firing the already prepared LAW at a rate of one every 15 seconds, each man will get four shots — the squad will get off 44 rounds against the 14 targets advancing at a rate of 80 meters every 15 seconds.

ROUND 1. There are too many targets for volley fire, so sequence firing techniques, supplemented with the known data, are used at ranges of 250-225 meters against the four tanks and seven of the BMP. Eleven rounds are fired.

Hits*: 3

Kills*: 2 BMP

ROUND 2. Sequence firing continues at ranges of 225-175 meters against four tanks and seven BMP. Eleven more rounds are fired.

Hits*: 6

Kills*: 1 tank, 2 BMP

ROUND 3. 175-100 meters. Hit probability is getting higher at these ranges. The squad fires 11 rounds at the three remaining tanks and six BMP.

Hits*: 8

Kills*: 1 tank, 4BMP

ROUND 4. 100-125 meters. Target priority switches to BMP, since the threat of infantry dismounting on the squad's positions is greater than the threat of the two remaining tanks. The squad fires its last 11 LAW at the two remaining BMP and two tanks.

Hits*: 9

Kills*: 2 tanks, 2 BMP

With all 14 of the vehicles knocked out, each man takes up his individual weapon to engage the personnel dismounting from the disabled vehicles.

*Expected hits calculated using probability data derived during the latest Ft Benning tests. If the May 74 data had been used, almost half of the enemy force would have reached the squad's positions.

SUMMARY

The accuracy improvement demonstrated by the January 76 test group over the May 74 group can be equated to doubling a LAW inventory given the same number of hits. Said another way, with proper training our gunners will miss only half as often. Equally important, training to use pair, sequence and volley tactics when appropriate can produce hit probabilities above AMSAA predictions. In brief, proper tactics and improved training can significantly increase the combat effectiveness of the weapon. Obviously, American soldiers need this edge to cope with the numbers of armored vehicles they are likely to encounter in the next war.

VI NEW DOCTRINE

Developing this combat edge through better training starts with doctrine based on a sound knowledge of weapon capabilities and limitations.

W — LAW is effective out to a maximum range of 200 meters for moving targets and 250 meters for stationary ones.

P — Training is essential.

- Train every soldier operating forward of the division rear boundary to be LAW proficient (*Note).
- Train extensively on range and speed estimation and simplified sighting rules. Use terrain reference points and sector cards for ranging.
- Use the LAW subcaliber device against moving targets.
- Train to improve rates of fire.

T — Sound tactics maximize hit and kill probabilities.

- Use volley, pair and sequence firing techniques when appropriate.
- Carry enough LAW to fight the kind of enemy you may encounter.
- Employ LAW in built-up areas in combat. Fire from inside buildings, down onto tanks.
- Shoot down onto tanks wherever you can.
- Slow, stop, or confine tanks with mines or obstacles where you want to hit them with LAW.
- Insure proper fire distribution when multiple targets can be expected.

*Note: The Army Signal School's approach to LAW is an excellent example of how to improve antitank protection for rear area units. They are teaching their basic officers to employ LAW in the defense of a signal unit and require each officer to fire the LAW subcaliber round.

APPENDIX A AIDS FOR TRAINERS

MAKING CHANGES

Before new doctrine can take effect in the field (where the majority of LAW training takes place), our training programs have to be revised, our literature updated, and new training aids fielded. It will also be necessary to establish standards to measure both individual skills and tactical proficiency within units.

All of these changes are being made; some are in the field now, some will be there later. This section provides a complete list of aids for trainers.

MANUALS AND OTHER PUBLICATIONS

The Weapon and the Subcaliber Trainer

FM 23-33 — The M72 LAW

FM 101-69-15, Joint Munitions Effectiveness Manual, contains AMSAA effectiveness data for LAW.

TM 9-1340-214-10, Operations Manual for LAW.

TM 9-1340-203-20 — M190 and M73 Subcaliber Systems.

How to Train Gunners

TC 23-20, Unit Antiarmor Training Programs (To be DA printed)

This TC provides the LAW training program based on the October 1974 LAW analysis. It will be revised to provide the training program which resulted from the January 1976 tests.

TC 71-5 Realtrain — tells how to use Realtrain techniques to train with LAW tactically.

Antiarmor Tactics

TC 7-24, Antiarmor Tactics and Techniques for Mechanized Infantry.

A manual for antiarmor tactics — includes LAW, Dragon, and TOW employment in combat.

TRADOC Bulletins

#1 — Range and Lethality of US and Soviet Antiarmor Weapons

#1^U — A new, unclassified version of TB #1

#2^U — Soviet ATGMs — Capabilities and Countermeasures

#3 — Soviet RPG 7

Training Extension Courses [TEC]

948-071-0005F — Operating the LAW

948-071-0007F — Methods of Engagement

MANNED MOVING TANK (A Do-It-Yourself Kit)

A pamphlet on how to prepare an M48/M60 tank for use as a manned moving tank can be obtained from your TASO.

TELEVISION TRAINER (TVT)

Most units now have a TVT on hand. This is an invaluable device for recording gunner firing positions and then critiquing performance on the spot.

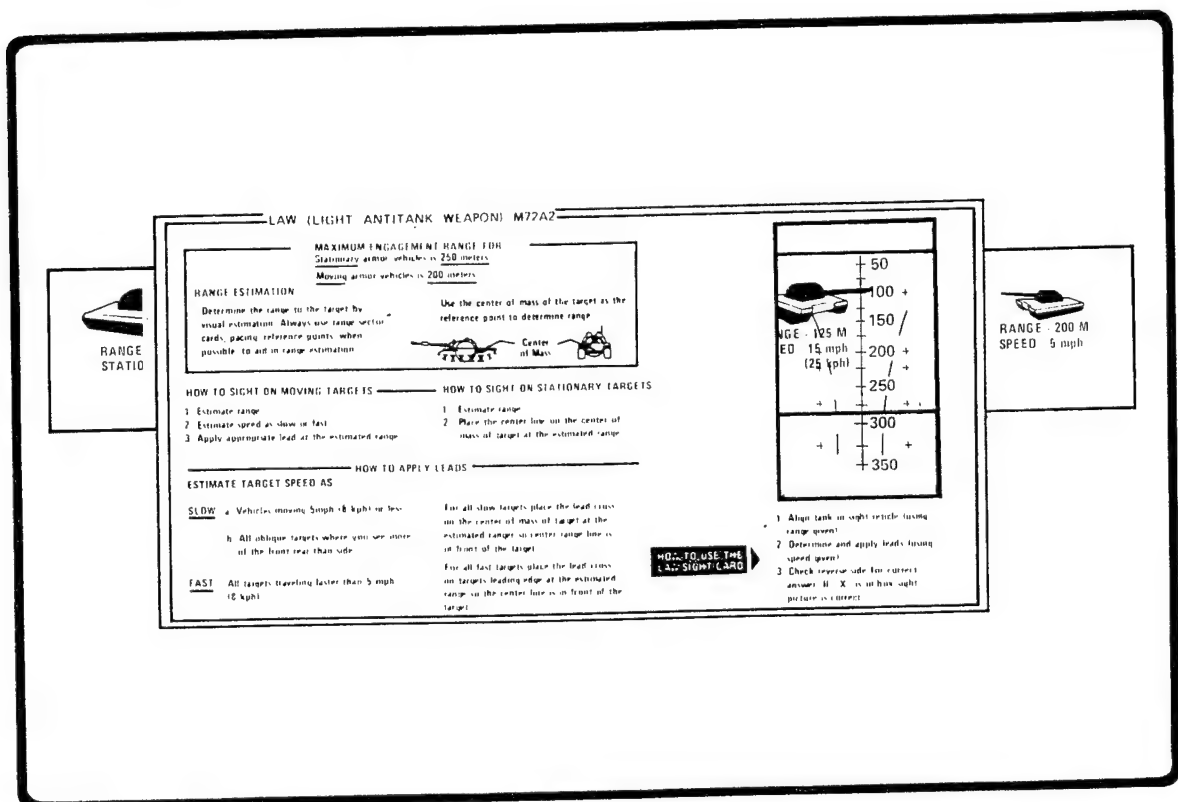
TV Tape 010-071-0046-B LAW

TRAINING AIDS AND DEVICES (Obtained Thru Your Supporting TASO)

GTA 7-1-23 66M HEAT Rocket M72A1

New — GTA 7-1-28 M72A2 LAW Sight Trainer

This GTA is a device designed to teach both range estimation and moving target leads with the LAW stadia sight. This picture shows what it looks like.



The sight section is identical to the actual sight. The soldier lines up a target under the sight and reads the range and target speed. If everything is right, an X will appear in a scoring box on the reverse side.

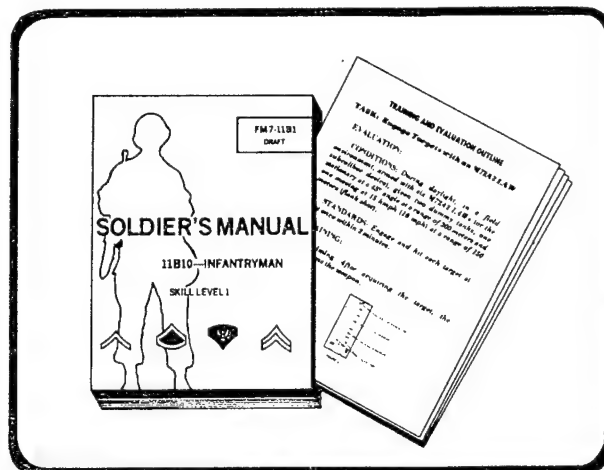
APPENDIX B

ESTABLISHING STANDARDS AND EVALUATING PERFORMANCE

INDIVIDUAL SOLDIER SKILL

Soldier's Manuals

In the near future, our soldiers will have a new series of manuals which will tell them exactly what they must know to be considered qualified at their skill level.



Soldier's Qualification Tests

These tests will replace the present MOS test systems. These tests —

- require demonstrated performance in critical tasks.
- will test the skills listed in the Soldiers Manuals.

LAW will be included in all SQT for soldiers whose MOS calls for duty in the combat area forward of the division rear boundary.

UNIT PROFICIENCY — ARTEP

The new series of Army Training and Evaluation Program (ARTEP) provides tasks, conditions, and standards that have to be demonstrated in the field. Proficiency is evaluated by performance.

LAW evaluation will be included in ARTEP for all units who normally operate forward of the division rear boundary. The standards of performance are shown here:

Task: Engage armor targets

Conditions:

- a. During daylight, on a suitable firing range, given:

(1) LAW launcher tube with M190 subcaliber device and seven M73 rockets (three rounds for stationary target phase, four rounds for moving target phase).

(2) A series of stationary targets located between 75 and 250 meters from the firer presented in a combination of frontal, flank, or oblique views.

(3) A moving (8 to 24 kmph) (5 to 15 mph) target located between 75 and 200 meters from the firer, presented in a flank view.

b. During night, on a suitable firing range, given:

(1) LAW launcher tube with M190 subcaliber device and three M73 rockets.

(2) Illumination provided by indirect fire or searchlight.

(3) A series of stationary targets located between 75 and 150 meters from the firer. Targets are presented in a combination of frontal, flank, or oblique views.

Standards:

a. During daylight firing phase, the soldier must achieve:

(1) Two hits of three subcaliber rockets fired at stationary targets.

(2) Two target hits of four subcaliber rockets fired at moving targets.

b. During night firing phase, the soldier must achieve one target hit of three rockets fired.

APPENDIX C

ORDERING TRADOC BULLETINS

Purpose. A series of TRADOC Bulletins are being published by HQ TRADOC to provide commanders timely technical information on weapons, tactics and training technique. It is not intended to supplant doctrinal publications, but to supplant material on "How to fight" with data derived from tests, recent intelligence, or other sources, which probe "why?"

Applicability. TRADOC Bulletins are developed by Headquarters, TRADOC using the most comprehensive and current military and civilian data available. Army Training and Evaluation Programs (ARTEP), Field Manuals (FM) and Training Circulars (TC) will continue to be the primary training references. TRADOC Bulletins will supplement them with an explanation of why we are training in a given manner. TRADOC Bulletins should enable commanders to better stimulate and motivate subordinates to understand why we train the way we do.

Index of Series. TRADOC Bulletins are cataloged in DA Pamphlet 310-3, "Index of Doctrinal, Training and Organizational Publications." The series are numbered consecutively and each TRADOC Bulletin is announced at time of printing in the information bulletin distributed to all pinpoint account holders by the US Army AG Publications Center.

Additional Copies. Submit DA Form 17 to order more copies of this TRADOC Bulletin.

Permanent Distribution. Pinpoint account holders receiving TRADOC Bulletin Number 1 from Baltimore will automatically receive two copies of all subsequent issues unless a DA Form 12-11B is submitted to change that quantity. Others desiring to be added to the permanent distribution list for TRADOC Bulletins must submit a DA Form 12-11B. Units which are required to submit publication requests through another headquarters should send the completed excerpt through proper authority.

Reference for Distribution Procedures. DA Pamphlet 310-10 explains the pinpoint distribution system and how to establish or update an existing account at the US Army AG Publications Center.

U.S. Government Printing Office: 1976-638-718/115 Region No. 3-II

Enter pinpoint account number
established with USA AG Pub Cen,
Baltimore, MD.

REQUISITION FOR PUBLICATIONS AND BLANK FORMS (AR 310-1)				PAGE NO. 1	NO. OF PAGES	DATE OF REQUISITION	ACCOUNT NUMBER	REQUISITION NUMBER (Assigned by Supply Source)
NAME OF REQUISITIONING AGENCY IF DIFFERENT FROM "SHIP TO" ADDRESS								
2. JUSTIFICATION FOR SPECIAL REQUISITION								
1. TYPE OF REQUISITION <input checked="" type="checkbox"/> REGULAR <input type="checkbox"/> SPECIAL								
3. REQUIRED DATE (Use Julian date) <input checked="" type="checkbox"/>								
4. ITEMS REQUESTED HEREON ARE <input type="checkbox"/> CLASSIFIED <input type="checkbox"/> FOUO <input type="checkbox"/> ACCOUNTABLE <input type="checkbox"/> SENSITIVE <input type="checkbox"/> ARNG <input type="checkbox"/> USAR <input type="checkbox"/> GRANT AID <input type="checkbox"/> FMS <input type="checkbox"/> TO BE PACKED WITH EQUIPMENT								
5. <input type="checkbox"/> SHIP TO: (Complete address, include ZIP Code)								
TO: Commanding Officer USA AG Publications Center 2800 Eastern Boulevard Baltimore, Maryland 21220								
7. REQUIREMENTS								
LINE NO.	NUMERICAL DESIGNATION OF REQUISITIONED ITEM	UNIT (Forms only)	QUANTITY REQUIRED	SPECIAL ACTION (See reverse side for explanation of symbols used)				
a	b	c	d	e				
TRADOC BULLETIN 5								
8. TYPED NAME AND GRADE OF COMMANDING OFFICER, ADJUTANT, PUBLICATIONS OR PROPERTY OFFICER <input checked="" type="checkbox"/>								
9. SUPPLY ACTION BY SOURCE OTHER THAN USAAGPC <input type="checkbox"/> MAIL <input type="checkbox"/> AIRMAIL <input type="checkbox"/> REGISTERED MAIL <input type="checkbox"/> OTHER (Specify)								
10. SHIPPED BY 11. CARTONS (Number) 12. BOXES (Number) 13. WEIGHT 14. DATE SHIPPED								
15. B/L OR REGISTRY NUMBER(S)								
16a. EDITED BY b. DATE 17a. FILLED BY b. DATE								

DA FORM 17
1 JAN 70

PREVIOUS EDITIONS WILL BE USED.

To obtain additional copies of this bulletin, complete all checked items, fold, and mail.

DEPARTMENT OF THE ARMY

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE \$300

POSTAGE AND FEES PAID
DEPARTMENT OF THE ARMY

DOD-314



Commander
US Army AG Publications Center
2800 Eastern Boulevard
Baltimore, Maryland 21220

(Fold and mail to above)

C
U
T

H
E
R
E

DA Form 12-11B EXCERPT

Enter account number that has been established with the USA AG Pub Cen, Baltimore, Md.

REQUIREMENTS FOR ARMY DOCTRINAL PUBLICATIONS (FM)			
For use of this form, see AR 310-2; the proponent agency is The Adjutant General's Office.			
1. TYPE OF REQUIREMENTS <input type="checkbox"/> a. INITIAL <input type="checkbox"/> b. CHANGE		3. ACCOUNT NUMBER	
2. DATE			
See DA Form 12-11 for Instructions			
4. THRU: (Include ZIP Code)		5. TO: Commanding Officer USA AG Publications Center 2800 Eastern Boulevard Baltimore, MD 21220	
6. FROM: (Include ZIP Code)			
7. LOCATION AND COMPONENT <input type="checkbox"/> CONTINENTAL UNITED STATES <input type="checkbox"/> USARL <input type="checkbox"/> USARHAW <input type="checkbox"/> OVERSEAS <input type="checkbox"/> ACTIVE ARMY <input type="checkbox"/> ARNG <input type="checkbox"/> USAR			
SUBJECT OR SUBJECT CLASSIFICATION		QUAN RQR	SUBJECT OR SUBJECT CLASSIFICATION
WRITE IN ITEMS		X	TRADOC BULLETINS
		QUAN RQR	430)

Note: Complete items 1, 2, 4, 6, and 7 as appropriate.

Enter number of copies required for TRADOC Bulletins in block # 430.

(Signature of Reviewing Authority)

(Signature of Requisitioner)

DEPARTMENT OF THE ARMY

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE \$300

POSTAGE AND FEES PAID
DEPARTMENT OF THE ARMY
DOD-314



Commander
US Army AG Publications Center
2800 Eastern Boulevard
Baltimore, Maryland 21220

(Fold and mail to above)

C
U
T

H
E
R
E

FEEDBACK

TRADOC Bulletins present information aimed at communicating principles, facts, the "why" of our doctrine, and other data important to soldiers. We'd like to know if we hit the target. Please respond to this questionnaire, cut out, fold and mail. Your reply will help in our efforts to fit your needs.

1. Did this bulletin
 - ☐ give you information you didn't know before
 - ☐ remind you of data you already know
 - ☐ just rehash data you already knew.
2. Whom do you think is the appropriate target audience of this bulletin? [Check any or all]
 - ☐ platoon leaders ☐ company commanders
 - ☐ battalion commanders ☐ division commanders
3. Where do you think this data should be used?
 - ☐ service schools ☐ unit training (EM) ☐ unit training (Officers)
4. Are you convinced the new LAW doctrine is correct?
 - ☐ Yes
 - ☐ No Explain:
5. Which TRADOC Bulletins have you read?
 - ☐ #1 (C) Range and Lethality of US and Soviet Anti-Armor Weapons (U)
 - ☐ #1 (U) Range and Lethality of US and Soviet Anti-Armor Weapons (U)
 - ☐ #2 (C) Soviet ATGMs: Capabilities and Countermeasures (U)
 - ☐ #2 (U) Soviet ATGMs: Capabilities and Countermeasures (U)
 - ☐ #3 (C) Soviet RPG-7 Anti-Tank Grenade Launcher (U)
 - ☐ #4 (C) Soviet ZSU-23-4: Capabilities and Countermeasures (U)
 - ☐ #6 Countersurveillance and Camouflage
 - ☐ #8 Modern Weapons on the Modern Battlefield
6. Other comments

DEPARTMENT OF THE ARMY

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE \$300

POSTAGE AND FEES PAID
DEPARTMENT OF THE ARMY
DOD-314



COMMANDER
US ARMY TRAINING AND DOCTRINE COMMAND
ATTN: ATCG-T (TEL: AUTOVON 680-2445/3135)
FORT MONROE, VIRGINIA 23651

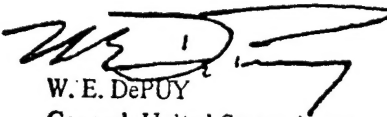
(Fold and mail to above)

C
U
T

H
E
R
E

TRADOC BULLETIN 5

30 June 1976



W. E. DePUY
General, United States Army
Commanding

DISTRUBUTION:

Active Army, USAR, and ARNG: To be distributed to all DA Form 12-11 accounts (one copy each account); plus in accordance with DA Form 12-11A, Requirements for The Rifle Co, Platoons and Squads (Qty rqr block no. 78); Techniques of Antitank Warfare (Qty rqr block no. 181); and DA Form 12-11B, Requirements for TRADOC Bulletins (Qty rqr block no. 430).

Additional copies can be requisitioned (DA Form 17) from the US Army Adjutant General Publications Center, 2800 Eastern Boulevard, Baltimore, MD 21220.